

COMMON ELEMENTS		PROCESSES AND PROPERTIES INDEX	
<p><b>F</b></p> <p>424. FOAMING OF BOILER WATER. <u>Sterman, L.</u> (Elektricheskie S<sub>ant</sub>antail (Pwr Stns), Sept. 1949, vol. 20, 17-22).</p> <p>The article provides results of investigations into the influence of pressure, boiler loading and nature and concentration of ordinary dissolved matter in boiler water on foaming. Investigations were carried out at 17 and 36 atms. for the purpose of establishing critical concentration values as a function of load for solutions of NaOH, Na<sub>2</sub>SO<sub>4</sub> and NaCl. The experimental installation is illustrated and results set out in a set out in a series of curves.</p>		<p><b>M</b></p>	
<p>ASH-SLA METALLURGICAL LITERATURE CLASSIFICATION</p>			
<p>SECTION DIVISION</p>		<p>SECTION DIVISION</p>	
<p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100</p>		<p>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100</p>	

PHASE I

TREASURE ISLAND BIBLIOGRAPHICAL REPORT

AID 295 - I

BOOK

Call No.: TJ265.T4

Authors: STERMAN, L. S., Kand. Eng. Sci. and STYUSHIN, N. G., Kand. Eng. Sci.

Full Title: EFFECT OF VELOCITY OF CIRCULATION ON THE HEAT EXCHANGE DURING  
EVAPORATION

Transliterated Title: Vliyanie skorosti tsirculyatsii na teploobmen pri  
kipenii

Publishing Data

Originating Agency: Ministry of Heavy Machine Building Industry (Glavkotloturboprom).  
Central Scientific Institute on Boilers and Turbines (TsKTI).  
This is an article from series on teploperedacha i  
aerogidrodinamika (Heat Transmission and Aero-hydrodynamics).  
Book 21, #5, p. 59-82.

Publishing House: State Scientific and Technical Publishing House of Literature  
on Machine Building.

Date: 1951

No. of copies: 2,000

Editorial Staff

Editor: Prof. Gukhman, A. A., Dr. Phys.  
Math. Sci.

Tech. Ed.: None

Editor-in-Chief: Golovin, S. A., Eng.

Appraisers: None

Text Data

Coverage: The article deals with experiments on heat transmission from flat sur-  
faces and tubes to boiling liquid circulated with different rates.  
Two experimental installations of both types of surfaces are illustrated  
1/2

F

M

4152. LAW GOVERNING THE CARRYING AWAY OF HUMIDITY IN DOWN BY  
STEAM IN BOILERS. Styrikovich, M.A., Stetsko, L.S. and Mityukov, T. Kh.  
Izvest. Akad. Nauk SSSR, Otdel. Tekh. Nauk (Bull. Acad. Sci. U.S.S.R.,  
Sect. Tech. Sci.), Aug. 1951, 1250-1258).



STERMAN, L. S.

Steam Boilers

Repeated discussion of problems concerning the removal of drop moisture in boilers,  
Izv. AN SSSR, Otd. tekhn. nauk, no. 3, 1952.

Monthly List of Russian Accessions, Library of Congress, October 1952. Unclassified.

USSR/Engineering - Heat exchange; High temperatures Mar 52

244T74  
"Investigation of the Effect of the Circulation Rate on the Value of Critical Heat Flow During the Boiling of Liquid in Tubes," L. S. Sterman, N. G. Styushin

"Zhur Tekh Fiziki" Vol 22, No 3, pp 446-451

States some branches of engineering now concerned with heat problems involving transfer of millions of large calories per hr from a square meter of surface. Describes results of experiments to establish dependence of critical heat flow and heat

244T74

flow at which there is transition from film boiling to turbulent boiling, on circulation rate. Uses isopropyl alcohol in special experimental setup. States problem significant for development of several special forms of power engineering equipment, for use of high- and superhigh- parameter steam, and for intensification of many forms of heat-exchange apparatus. Credits Prof A. A. Gukhman, Dr Phys-Math Sci, for valuable assistance.

244T74

USSR

4773 CTS-62

ON THE THEORY OF THE HEAT TRANSFER FROM A  
BOILING FLUID. L. B. Stermen. Translated from Zhur.  
Tekh. Fiz. 23, 341-351 (1953). 10p. Available from  
Charles House, London, England.

The differential equations describing the heat transfer by  
convection during the boiling process, and the equations  
defining the conditions for the transfer of heat during boil-  
ing from the laminar transition layer to the turbulent core,  
are deduced. A functional relationship between the  
similarity criteria for the case of heat interchange during  
the boiling process is established. The experimental data  
for the determination of the critical heat flow values during  
boiling in a large volume, and some data regarding the  
interchange of heat during the boiling process in pipes, are  
represented in the form of defined characteristic relations.  
(auth)

BB

27

STERMAN, L. S.

V 536.24  
9603. On the theory of heat exchange (in boiling in  
pipes. L. S. STERMAN. Zh. tekhn. Fiz., 24, No. 2,  
62 250-7 (1954) In Russian.

A system of differential equations is given which  
describe, in hydraulic form, the heat exchange on  
boiling in pipes. A general functional relation is  
established between criteria of similarity. On the  
basis of the results obtained, an analysis is given of

certain relations and criteria previously established  
by other investigators.

J. B. SYKES



SECRET

U S S R

536.24  
6982. Investigation of heat exchange in the boiling  
of a liquid in pipes. L. S. STERMAN. *Zh. tekhn. Fiz.*,  
24, No. 11, 2046-53 (1954) in Russian.

62

Experiments were performed on this subject in order to relate the heat exchange to various criteria depending on the circulation rate, the thermal flux and, to some extent, the vapour content; the range examined, however, was that where the vapour content has no noticeable effect. The results were combined with those of the author and of other workers, for both water and ethyl alcohol, and graphs are given showing the interrelation of the values found; these lie on a common curve representing a certain function of the criteria concerned. The pressures used range from 2 atmospheres to 52 atmospheres, the circulation rates from 0.2 to 6.67 m/sec, and the thermal fluxes from 22000 to 1000000 kcal/m<sup>2</sup>hr. Although the results are valid only for the case of low vapour contents, a number of situations are pointed out in which they can be applied to calculate the heat exchange. J. B. SYKES

STERMAN, L.S., kandidat tekhnicheskikh nauk; KALININ, K.M., inzhener.

Improvement of steam separation in ISV evaporators. Energomashino-  
stroenie no.1:18-22 0 '55. (MLBA 9:5)

(Evaporating appliances)

AID P - 1328

Subject : USSR/Engineering

Card 1/1 Pub. 110-a - 10/19

Authors : Styrikovich, M. A., Corr. Memb., Academy of Sciences,  
USSR., Sterman, L. S., Kand. of Tech. Sci. and  
Syrnov, A. V., Eng.

Title : Study of the carrying away of salts by steam by means of  
radioactive isotopes

Periodical : Teploenergetika, 2, 43-46, F 1955

Abstract : This article presents the results of study by means of  
radioactive isotopes of the relation between the intensity  
of carrying away of salts by steam and the volume of the  
steam load. The results obtained by this method are com-  
pared with those established previously by the salt method.  
The equipment used is shown and the results are plotted on  
charts. Two Russian references (1950 and 1953).

Institution : Moscow Section of the Central Scientific Research Insti-  
tute for Boilers and Turbines

Submitted : No date

• Teploenergetika, 8, 39-43, Ag 1955

AID P - 2569

Card 2/2      Pub. 110-a - 8/16

Central Scientific Research Institute for Boilers and  
Turbines)

Submitted : No date

STERMAN, Lev Samoylovich, kandidat tekhnicheskikh nauk; STYUSHIN, N.G.  
re'tsenzent, kandidat tekhnicheskikh nauk; SHLYKOV, Yu.P.  
redaktor, kandidat tekhnicheskikh nauk; MODEL', B.I.  
tekhnicheskiiy redaktor

[Evaporators] Ispariteli. Moskva, Gos. nauchno-tekhn. izd-vo  
mashinostroit. lit-ry, 1956. 67 p. (MLRA 10:5)  
(Evaporating appliances)

*Sterman, L.S.*

✓ 3140. USE OF GAMMA RAYS TO DETERMINE THE STEAM CONTENT AND TRUE WATER  
LEVEL IN APPARATUS. Sterman, L.S. and Shteyn, A.M. (Energetichesk. App.  
 1956, vol. 6, 188; Teploenergetika (Heat Engng. Technol.), Aug. 1956, 39-  
 43). Measurements were made with a radially isotropic cobalt-60 and counter  
 to determine the h.p. steam content of a flowing mixture of steam bubbles and  
 water in a vertical 9 1/2 in. pipe. The equipment, measuring methods and means  
 of evaluating the results are described. (L). C.S.A.

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*1-2mf*

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STERMAN, L.S.

Modification of evaporators in state district power stations.  
From.energ.ll no.5:22-23 My '56. (MLRA 9:9)  
(Evaporating appliances)

STERMAN, L.S.

Generalization of experimental data on building vapor through liquids.  
Zhur.tekh.fiz.26 no.7:1519-1524 J1 '56. (MLA 9:9)  
(Bubbles) (Steam)



PA - 1587

CARD 1 / 2

SUBJECT USSR / PHYSICS  
AUTHOR STERMAN, L.S., STJUSIN, N.G., MOROZOV, V.G.  
TITLE The Investigation of the Dependence of Critical Heat Flux in  
Circulation Velocity.  
PERIODICAL Zhurn. techn. fis., 26, fasc. 10, 2323-2338 (1956)  
Issued: 11 / 1956

This investigation was carried out with ethyl alcohol (rectification) and distilled water. The experimental order has already previously been described by L. STERMAN and N.G. STJUSIN, Zhurn. techn. fis., 22, 3 (1952). The necessary properties of alcohol are enumerated. Here measurements were carried out at low circulation velocities  $w_0$  with the same throttle diaphragm as also with high  $w_0$ .

However, the pressure gradient of the diaphragm was on this occasion not measured with mercury but with ethyl alcohol. The device used for measuring the pressure gradient consists of a reversed differential manometer. The method of determining the maximum heat flux was retained. This method permits the determination of  $q_{min}$  for water at  $w_0$  up to 1,0 m/sec.  $q_{min}$  is the heat flux during

transition from filmlike to bubblelike boiling. For the determination of film boiling by the critical heat flux a better method was worked out. For this purpose an inert gas was introduced under pressure into the test tube on to the upper part of the heating surface. By means of this improved method it was possible to carry out several tests for the determination of  $q_{min}$  for water at circulation velocities of up to 2,0 m/sec.

STERMIV, L-S.

1657. INVESTIGATION OF STEAM QUALITY AT 185 ATM. Stumman, L.S.,  
Antonov, A.Ya. and Burnov, A.V. (Teploenergetika (Heat Engng, Moscow),  
Mar. 1957, 17-22). Laboratory experiments are recorded on the determination  
of critical concentrations and the investigation of carryover in the  
subcritical range at 185 atm. The results are compared with relationships  
obtained under similar conditions at other pressures. (L).

STERMAN, L.S.

10(4); 21(5); 24(8) PHASE I BOOK EXPLOITATION SOV/2457

Vsesoyuznaya nauchno-tekhnicheskaya konferentsiya po primeneniyu radioaktivnykh i stabil'nykh izotopov v nauke i zhizni i illichnely v narodnom khozyaystve i nauke. 2d. Moscow, 1957

Tekhnika i gidrodinamika: trudy konferentsii, tom. 4 (Heat Engineering and Hydrodynamics: Transactions of the All-Union Conference on the Use of Radioactive and Stable Isotopes and Radiation in the National Economy and Science, Vol. 4) Moscow, Gosenergoizdat, 1958. 88 p. Errata slip inserted. 2,500 copies printed.

Sponsoring Agencies: Akademiya nauk SSSR, and USSR. Glavnoye upravleniye po ispol'zovaniyu atomoy energii.

Eds.: M. A. Styrikovich (Resp. Ed.), G. Ye. Khodovskiy, and M. S. Pechenev; Ed. of Publ. House: L. M. Sinelnikova; Tech. Ed.: M. I. Borunov.

PURPOSE: This collection of articles is intended for scientists and laboratory workers concerned with the use of radioactive and stable isotopes.

COVERAGE: This collection of papers deals with the application of radioactive and stable isotopes as measuring tools in various types of scientific investigation. No personalities are mentioned. References are given after some of the articles.

2. Bartolomey, G.O., Ya.G. Vinokur, V.A. Kolokol'tsev, and V.K. Petukhov. Use of Gamma Rays for Studying the Process of Diffusion 9
3. Kutateladze, S.S., and V.M. Moskvichnev. Use of Gammaradio- scopy for Studying the Hydrodynamics of a Multilayer System 12
4. Paleyevskiy, P.O., and M.A. Shapkin. Method of "tagged" atoms for investigating water and steam content in surface boiling of a fluid 16
5. Kudryavtsev, V.S. Determining the Specific Surface Area of Gases and Cement Powders by the Sorption Method with the Use of "tagged" atoms 20
6. Moskvichnev, V.M., and I.I. Kurbatova. Use of Radioactive Isotopes for Studying Sulfate Corrosion of Concrete 28
7. Tsytoich, M.A., V.I. Ponomarev, and V.A. Lukin. Methods for Determining the Density and Moisture Content of Soils with the Aid of Radioactive Emissions 33
8. Polozova, L.G., and R.Y. Reizman. Study of the Processes of Moisture Transfer in Building Materials by Means of Gammaradio- scopy 38
9. Styrikovich, M.A., I.Kh. Khaybulin, and L. K. Khokhlov. Use of Radioactive Isotopes for Investigating the Solubility of Salts in Water Vapor at High Pressures 41
10. Stermann, L.S., A.Ya. Antonov, and A.V. Sumov. Investi- gation of the Characteristics of Vapor at a Pressure of 185 atm. with the Aid of Radioactive Isotopes 46
11. Dubrovskiy, V.A. Use of Radioactive Isotopes for Observing the Motion of the Molten Glass Mass in Glass Furnace Tanks 52
12. Bachinskij, V.V. Use of Radioactive Isotopes in Studying the Filtration of Fluids Through Porous Media 57
13. Leypunskaya, D.I., and A.Ya. Fruslin. Radioisotope Methods for Investigating Flow Processes of Fluids in a Porous Medium 62
14. Berts, M.A., L.S. Zharbin, V.S. Kachinsky, and L.L. Korak. Investigation of the Hydrodynamics of a Fluid in the Conical Rotor of a Settling Centrifuge with the Aid of Radioactive Isotopes 67
15. Volynskiy, M.P., M.V. Churayev, and B.Ya. Mitkov. Investi- gation of the Motion of Molecules in a Gas Under Laboratory and Field Conditions with the Use of Radioactive Isotopes 72
16. Arzhantsev, M.M. Use of Radioactive Isotopes for Investi- gating Suspensions of River Silt 78
17. Yermak, A.I., and A.S. Shubin. Use of Radioactive Isotopes for Investigating the Mechanics of the Drying Process 85

OLSHAN, L. D. (Inst. Tech. Sci., Moscow), V. A. (Eng.) and KRYAZHEV, S. A. (Eng.)

"A Study of Heat Exchange during Boiling of Liquids in Tubes at Various Pressures up to 25 atm."

Report presented at sci. and tech. session on Heat Exchange during Change of Aggregate State of Matter (to Comm. on High Steam Conditions, lower inst, AS USSR, and Inst. Thermal Engineering, AS UkrSSR) Kiev, 23-25 Sep 57.

Inst. Thermal Engineering, Acad. Sci. Ukr. SSR (For Chernobyl'skiy and Belitskiy)  
Cent. Boiler Turbine Inst. (For Merchenko)

Moscow Division, Cent. Boiler Turbine Inst.

AUTHOR: Sterman, L. S. 57-20-7-29/35

TITLE: On the Theory of Vapor Separation (K teorii paroseparatsii)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Vol. 28, Nr 7,  
pp. 1562 - 1574 (USSR)

ABSTRACT: A system of differential equations expressing the disintegration and the transport of drop humidity is set up. This system is made use of for the formation of a general system of similarity criteria. In the formation of this system of differential equations the author proceeded from the following fact: the motion of the vapor humidity flow is expressed by the generally known equations of motion in the range unto the evaporation level as well as above it. The disintegration of the liquid to drops because of the change of the kinetic flow energy takes place in such a way that the kinetic energy is used for the work against the surface forces and friction forces (a small part of the energy is used for overcoming gravity). The drops forming in the disintegration at the phase limit reach the evaporation space and are carried along by the current, or they fall back on the evaporation level.

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On the Theory of Vapor Separation

SOV/57-23-7-29/35

The equation expressing the coincidence between the changes of kinetic, surface, and heat regime during the disintegration of the liquid is called the disintegration equation. The equation of motion together with the disintegration equation describe the processes which lead to the disintegration of the liquid under the formation of the drop quantity at the phase limit. These equations are used for the formation of the system of similarity conditions. The latter determines the amount of humidity which is separated from the evaporation level as drops. For setting up the general critical dependence determining the amount of humidity separated by the vapor flow from the vapor volume the author first carries out an analysis of equations expressing the motion of drops in the vapor volume and the own evaporation of the drop during the motion of the drop.

The totality of all mentioned differential equations describes the processes determining the separation of the drop humidity from the vapor (separation) volume of a certain dimension by the vapor.

The formula (22) deduced for the humidity of the vapor  $\omega$  shows clearly that the separation of the drop humidity does not only depend on the processes occurring in the vapor

Card 2/3

On the Theory of Vapor Separation

DOI: 57-23-7-29/35

space but also on the hydrodynamics of the water space. Professor M. A. Styrikovich, Corresponding Member, Academy of Sciences, USSR, and Professor A. A. Gukhman, Doctor of Physical and Mathematical Sciences, gave advice to the author. There are 4 figures and 1 Soviet

ASSOCIATION: Tsentral'nyy kotloturbinnyy institut im. I. I. Polzunova, Moskva  
(Central Institute of Boiler Turbines imeni I. I. Polzunov, Moscow)

SUBMITTED: January 26, 1957

1. Vapors--Separation

Card 3/3

STERNIN, L. S.: Doc Tech Sci (diss) -- "Investigation of certain problems of heat exchange and hydrodynamics in steam generation (using the theory of similarity)". Moscow, 1959. 18 pp (Min Higher Educ USSR, Moscow Order of Lenin Power Engineering Inst), 150 copies (KL, No 13, 1959, 103)



SOV/96-59-5-11/19

AUTHORS: Sterman, L.S., Candidate of Technical Sciences and  
Golubev, Ye.K., Engineer

TITLE: The Use of Two-Stage Steam-Washing in Evaporators  
(Primeneniye dvukhstupenchatoy promyvki para na  
isparitelyakh)

PERIODICAL: Teploenergetika, 1959, Nr 5, pp 59-65 (USSR)

ABSTRACT: Until recently, it has been thought that feed water of sufficient purity for once-through boilers could only be produced by deep desalting, which is expensive. In recent years a new steam-washing circuit, originally described by Sterman in Energomashinostroyeniye, 1955, Nr 1, has been widely used in Soviet power stations. When this circuit is used the salt content of the distillate is greatly reduced and is usually some tenths of a milligram per kilogram of distillate, whilst blow-down does not exceed 2 to 3% as against 8 to 12% with other constructions of evaporators. At normal load, the salt content of distillate from evaporators with steam-washing devices to the designs of the Moscow Division of the Central Boiler Turbine Institute is about 1/2000 of the salt content of the feed water delivered to the

Card 1/5

SOV/96-59-5-11/19

The Use of Two-Stage Steam-Washing in Evaporators

evaporators. Thus, with these evaporators, distillate with a salt content of 50 micrograms/kg can be obtained only if the salt content of the feed water does not exceed 100 mg/kg. As softened water usually has a higher salt content than this, the methods of purifying steam in evaporators need still further improvement. In the evaporators described, the steam is washed with feed water and then separated in screen separators. The purity of the distillate obviously depends on the purity of the feed water used to wash it and can be increased if the steam is further washed with condensate. The amount of condensate required for this purpose is small, being only 5% of the evaporator output, and there are no additional energy losses. The new steam-purifying circuit was applied to an evaporator type ISV-300 used to make up condensate loss in the once-through boilers of a high-pressure heat and electric power station. For purposes of comparison, this installation included a second evaporator for ordinary steam-washing and purification

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SOV/96-59-5-11/19

The Use of Two-Stage Steam-Washing in Evaporators

by the method of the Moscow Division of the Central Boiler Turbine Institute; in which the steam is washed only with feed water. Drawings of the original form of the evaporator type ISV-300 and the more recent version with single-stage steam-washing appear in Fig 1 and 2 respectively; the differences are described. Latest version, type ISV-300M, with two-stage steam washing, is shown in Fig 3 and discussed. An electro-mechanical automatic feed-regulator, diagrammatically illustrated in Fig 4, was used and is described. Sectioned drawings of the float chamber and valve box of the regulator are shown in Fig 5. A schematic circuit of the evaporator installation after modernisation of the evaporators is given in Fig 6, two stage steam washing being used in one evaporator and ordinary single-stage washing in the other. The quality of the distillate was determined from the sulphate residue and, in some cases, determinations were also made of the silicic acid content. Test results for the evaporator with single-stage steam-washing, given in Table 1, show that the sulphate content of the

Card 3/5

SOV/96-59-5-11/19

# The Use of Two-Stage Steam-Washing in Evaporators

distillate is 0.13 mg/kg even under the best conditions: this is too high for once-through boilers. Tests results on the two-stage evaporator are recorded in Table 2; they indicate that the quality of the distillate is much improved and also that it is more effective to wash the steam with cold water than with water at saturation temperature. When washing the steam with condensate at a temperature of 25 to 30°C delivered to the evaporator at the rate of about 5% of the evaporator output, the salt content of the distillate does not exceed 0.089 mg/kg, even with an output of 30 tons per hour. As will be seen from the curves in Fig 7, the salt content of the distillate increases with the salt content of the concentrate. Data on silica carry-over is given in Tables 3 and 4; it will be seen that although the silica content of the concentrate is very high, it is present to the extent of only a few hundredths of a milligram per kilogram in the distillate. It is concluded that the use of two-stage steam washing in

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SOV/96-59-5-11/19

**The Use of Two-Stage Steam-Washing in Evaporators**

evaporators can reduce the salt content of distillate to some hundredths of a milligram per kilogram. Still better results should be obtained with the other types of evaporator, which are used mainly in regional power stations. There are 7 figures, 4 tables and 6 Soviet references.

ASSOCIATION: MO TsKTI (The Moscow Division of the Central Boiler Turbine Institute)

Card 5/5

STERMAN, L.S.; MOROZOV, V.G.; KOVALEV, S.A.

Studying heat exchange to boiling water and ethyl alcohol  
in pipes. Inzh.-fiz.zhur. no.10:40-45 0 '59.

(MIRA 13:2)

1. Energeticheskiy institut im. G.M.Krzhizhanovskogo i  
TSentral'nyy kotloturbinnyy institut, Moskovskoye otdeleniye,  
Moskva.

(Heat--Transmission)

81380

Z/038/60/000/03/01/007

21.1920

AUTHORS: Margulova, T.Ch. and Sterman, L.S.

TITLE: Methods of Increasing the Efficiency of Nuclear Power Plants With a Gas-Cooled Reactor 79

PERIODICAL: <sup>19</sup>Jaderná energie, 1960, No. 3, pp. 74 - 79

TEXT: The article analyzes the main factors influencing the efficiency of nuclear power plants with a gas-cooled (CO<sub>2</sub>) reactor, namely the pressure of the coolant, the size of the heat-exchange area and the temperatures of the coolant on the inlet and outlet sides of the reactor. The calculations, on which this article is based, have been made at the Chair of Nuclear Power Plants of the Moscow Power Engineering Institute, in collaboration with 2 Czechoslovak students, Plávka and Vlček, who are studying the special field of "Designing and operation of nuclear power equipment" at the MEI. In these calculations it is assumed that the minimum difference of temperatures between the cooling gas and the working medium at its boiling point is 20°C, and the superheating of the steam in superheaters is 30°C. The pressure losses in the piping leading to the turbine and in the regulation valve are assumed to be 5% of the initial pressure each, and the pressure losses in the piping and fittings of the regenerative heaters are 10% of

Card 1/4

91360

Z/038/60/000/03/01/007

# Methods of Increasing the Efficiency of Nuclear Power Plants With a Gas-Cooled Reactor

used. Figure 3 shows typical curves indicating the changes of ultimate efficiency in dependence on the temperature of the feed water for cycles with one and two pressures and 1, 3, 5 and 10 regenerative heaters respectively. It can be seen that under the conditions considered the most favorable cycle is the one with a regenerative heating to temperatures of the feed water  $t_{nv}$  of from 100 to 110°C, and in a two-pressure cycle to a  $t_{nv}$  of from 100 to 130°C. It is possible to establish in a similar way the parameters of the low-pressure and high-pressure steam respectively and the temperature of the feed water, which at given values of  $t_{p1}$  and  $t_{p2}$  produce an optimum thermal efficiency, as is shown in Figure 4. With the increasing temperature of the gas leaving the steam generator the efficiency on the terminals of the electric generator increases constantly, too. With the increasing  $t_{p2}$ , however, increase also the losses by the circulation of the cooling gas, resulting in turn, in an impairment of the ultimate efficiency. The relations in this respect are shown in Figures 5 and 6. It can be seen from what has been said here that the economy of nuclear power plants with gas-cooled reactors can be further increased by improving their equipment, by a gradual transition to higher temperatures of the coolant in the primary circuit and to higher steam parameters, by perfecting the thermal cycles, etc. It can be

Card 3 -



81380

2/038/60/000/03/01 007

Methods of Increasing the Efficiency of Nuclear Power Plants With a Gas-Cooled Reactor

stressed, however, that even at the present state of development in equipment and heat potentials of working media considerable improvements in efficiency can be achieved if we succeed in creating such operating conditions as will produce an optimum thermal efficiency. There are 8 diagrams. *44*

ASSOCIATION, Chair of Nuclear Power Plants of the Moscow Power Engineering Institute, Moscow

Card 4/4

SL378

Z/038/60/000/004/001/005

A201/A026

21.1920 (1033, 1482)  
26.1300

AUTHORS: Sterman, Lev, Samoilovich; Bohal, Ladislav

TITLE: Selection of Optimum Thermal-Economy Cycle for the First Czechoslovak Nuclear Power Plant

PERIODICAL: Jaderná energie, 1960, No. 4, pp. 110 - 115

TEXT: The paper deals with a basic method of thermal economy analysis for nuclear power plants with gas-cooled reactors, as developed by the Department of Nuclear Power Plants at the MEI (Moscow Power Institute). The method is applied to the analysis of the first Czechoslovak nuclear power plant with a gas-cooled, heavy-water moderated reactor using natural uranium. A basic block-schematic of the nuclear power plant is shown in Figure 1. The plant provides for a two-pressure steam cycle. Feed-water heating for the low-pressure stage is done in two stages. The first stage of the heater is common to both pressures. This arrangement of the thermal cycle yields a better thermal efficiency than a cycle, in which both heaters are placed immediately before their respective steam generators. To determine the optimum thermal efficiency, the method uses the calculus of variations assuming the steam pressure of one stage to be constant, while the

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84378  
Z/033/60/000/004/001/005  
A201/A026

# Selection of Optimum Thermal-Economy Cycle for the First Czechoslovak Nuclear Power Plant

pressure of the other one is varying (Fig. 2). The values of the working fluid are calculated for certain characteristic points of the high- and low-pressure stages. In these calculations, made for a chosen pressure value  $p_v$  (in atmospheres) of the high-pressure stage, a T - Q diagram was prepared and the electric efficiency  $\eta_e$  of the cycle was determined. In all cases (of the T - Q diagram), the minimum temperature difference between the primary-loop coolant and the working fluid (at its boiling point) was assumed to be  $\Delta t = 15^\circ\text{C}$  for the high-pressure steam, and  $\Delta t = 10^\circ\text{C}$  for the low-pressure steam (both values in conformity with the projected values for the steam generators of the Czechoslovak nuclear power plant). The temperature drop at the steam outlets from both superheaters was assumed to be  $\Delta t = 20^\circ\text{C}$ . Pressure losses in the feed piping to the turbine and in the regulation valves were assumed to be 5% of the initial pressure for each (i.e., a total of 10%). Pressure losses in piping and fittings of regenerative heaters were assumed to be 10% of the pressure at the bleeding point of the turbine. The calculations of the thermal efficiency of the turbine's high- and low-pressure stages were made on the basis of the following relations:

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$$\eta_{oix}^v = 0.85 \left[ 1 - y_s \left( 1 - \frac{h_{oc}^v}{h_{op}^v} \right) \right] \quad (1)$$

$$\eta_{oix}^n = 0.84 \left[ 1 - y_s \left( 1 - \frac{h_{oc}^n}{h_{op}^v} \right) \right] \quad (2)$$

where  $y_s$  is the average steam moisture during steam expansion,  $h_{oc}^v$  the overall temperature drop of the high-pressure stage (in kcal/kg),  $h_{oc}^n$  the overall temperature drop of the low-pressure stage (in kcal/kg),  $h_{op}^v$  partial temperature drop in the superheated-steam region of the high-pressure stage (in kcal/kg). The condenser pressure was assumed to be 0.05 atm, exhaust losses 5.0 kcal/kg. The calculation procedure was as follows: First, optimum feed-water temperature  $t_{nv}$  was established, and the gross electric efficiency  $\eta_{er}$  of a plant with regenerative heating was determined for a varying number of heaters. By comparing the results obtained, the influence of the number of heaters on  $\eta_{er}$  was investigated for a chosen value of the coolant temperature at the steam generator inlet  $t_{m1}$  and outlet  $t_{m2}$  and a given  $p_v$ , assuming that the feed-water heating was equal

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in each heater. Curves indicating the changes of  $\eta_{er}$  in various cases are shown (Figs. 3, 4 and 5). It can be seen that the electric efficiency increases with the increasing  $t_{m2}$ . At the same time the losses are growing owing to the circulation of the coolant; however, they are returned to their greater part into the cycle in the form of thermal energy. The net electric efficiency of the cycle with the consideration of the losses for the coolant circulation can be calculated from the equation:

$$\eta_e^n = \frac{1 - k}{1 - k\varphi\eta_e} \cdot \eta_e \quad (6)$$

where  $k$  is the relative part of the power plant's total gross electric output consumed for the coolant circulation, and  $\varphi$  that part of the energy needed for the circulation, which is returned to the cycle. Assuming a constant thermal output of the reactor, the proportion of the relative losses for the coolant circulation can be established from the expression

$$\frac{k''}{k'} = \left( \frac{t_{m1} - t_{m2}''}{t_{m1} - t_{m2}'} \right)^3 \cdot \frac{(\gamma \cdot \gamma_2)''}{(\gamma \cdot \gamma_2)'} \cdot \left( \frac{c_p''}{c_p'} \right)^3 \cdot \frac{\eta_e''}{\eta_e'} \quad (7)$$

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where  $k'$  is the value of the part of electric energy consumed for the coolant circulation,  $\bar{\gamma}'$  the average specific weight of the coolant (in  $\text{kg/m}^3$ ),  $\gamma_2'$  the specific weight of the coolant at the turboblower input (in  $\text{kg/m}^3$ ),  $c_p'$  the average specific heat of the coolant at a given pressure (in  $\text{kcal/kg } ^\circ\text{C}$ ), for a given temperature of the coolant at the steam generator output  $t_{m2}'$ ; and  $k''$ ,  $\bar{\gamma}''$ ,  $\gamma_2''$ ,  $c_p''$ , the same values for a temperature of the coolant at the steam generator output  $t_{m2}''$ . Figures 6 and 7 show the curves of the net electric output changes in a cycle without regenerative heating and with regenerative heating respectively in dependence on  $t_{m2}$ , prepared on the grounds of the equation (6). It can be seen from the curves (Figs. 6 and 7) that, at a constant value of the reactor thermal output  $Q_r$  (removed by the coolant), the  $\eta_g^0$  and  $\eta_{er}^0$  increase within a certain range with increasing  $t_{m2}$  in spite of the increasing  $k$ . With a further increase of the losses for circulation, however, these values start decreasing with increasing  $t_{m2}$ . An increase of the reactor thermal efficiency can, therefore, be accomplished either at the expense of the coolant flow-speed through the reactor or at the expense of the coolant heating in the reactor ( $\Delta t_2 = t_{m1} - t_{m2}$ ). It can be seen

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that there is a direct relation between the output losses due to coolant circulation and the coolant temperatures at the inlet and outlet of the steam generator. The project of the Czechoslovak nuclear power plant provides for the following operational parameters:  $t_{m2} = 97^{\circ}\text{C}$ ; losses for coolant circulation: 18% ( $k=0.18$ ). Regenerative heating is not considered. These conditions give a maximum efficiency value of 0.217 (Fig. 6, Point I). Optimum thermal efficiency could be achieved at  $t_{m2} = 109^{\circ}\text{C}$ , but it would increase the maximum efficiency value by a mere 0.06%. Table 1 shows a comparison of the parameters chosen for the Czechoslovak nuclear power plant to the optimum parameters, as follows: (Abstracter's note: First figures are the parameters as chosen for the Czechoslovak nuclear plant, figures in parentheses are the optimum values.) It can be seen that the values chosen differ only slightly from the optimum ones. It is noted that at  $t_{m2} = 97^{\circ}\text{C}$  and a pressure ( $p_v$ ) variation within the range from 30 to 42 atm, the efficiency remains practically unchanged. It is, therefore, of advantage to choose as low a pressure as possible, as has been done in the object of the Czechoslovak nuclear power plant. Table 2 shows a comparison of optimum parameters of a cycle without re-

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generative heating to those of a cycle with regenerative heating. This comparison shows that even with a larger number of regenerative heaters the efficiency increases only 0.7%, while considerably complicating the whole design and increasing capital investments. For these reasons a cycle without regenerative heating has been chosen for the Czechoslovak nuclear power plant. (Translated from Russian by Engineer Oldrich Šíma, edited by A. Ševčík.) There are 7 figures, 2 tables and 10 references: 2 Czechoslovak, 5 Soviet and 3 non-Soviet-bloc. ✓

ASSOCIATIONS: Moskevský energetický institut (Moscow Power Institute) (Stermán, L.S.); Energoprojekt, Praha (Power Plant Design Engineering Institute, Prague) (Bohál, L.)

Card 7/7



STERMAN, L.S., kand.tekhn.nauk; PETUKHOV, V.V., inzh.; PROTSENKO,  
V.P., inzh.; CHIKILEVSKAYA, A.V., inzh.

Analyzing the heat efficiency of atomic power plants with a  
gas coolant. Teploenergetika 7 no.9:6-12 S '60. (MIRA 14:9)

1. Moskovskiy energeticheskiy institut.  
(Atomic power plants)

21.1920

81745  
S/089/60/008/05/04/008  
B006/B056

AUTHORS: Margulova, T. Kh., Sterman, L. S.

TITLE: An Increase in the Efficiency of Gas-cooled Power Reactors/9

PERIODICAL: Atomnaya energiya, 1960, Vol. 8, No. 5, pp. 448 - 451

TEXT: An increase in the cooling gas temperature at the output of the reactor leads to an increase in efficiency. The present paper deals with problems connected with the determination of the optimum (material-dependent) temperature. First, several details concerning coolant circulations with one, two, and three pressures are discussed. Fig. 1 shows the change in the efficiency  $\eta_e$  with pressure in the high-pressure circulation of a device operating on the basis of the two-pressure system. The curves hold for the case in which no regenerative heating of the feed water occurs and the gas temperature at the reactor output amounts to 375°C. In a gas-cooled reactor the steam pressure falls in the low-pressure cycle in the case of fixed in- and output temperatures

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An Increase in the Efficiency of Gas-cooled  
Power Reactors

S/089/60/008/05/04/008  
B006/B056

of the gas and constant high pressure with an increase in feed-water temperature; this exerts a negative influence upon efficiency. Fig. 2 shows the efficiency changes due to feed-water temperature (for one- and two-pressure systems). Fig. 3 shows the maximum efficiency with and without regenerative heating as function of the coolant temperature at the input (at a constant output temperature =  $375^{\circ}\text{C}$ ) for one- and two-pressure cycles. It is found that regenerative heating in one-pressure systems leads to an increase in efficiency only if the input temperature of the coolant  $t_{T,2}$  is above about  $170^{\circ}\text{C}$ , which is the case for two-pressure cycles at much lower temperatures. Besides efficiency, also the losses due to coolant circulation increase with an increase of this temperature. If these losses are taken into account, the maximum efficiency for the case of feed-water regenerative heating for one- and two-pressure systems can be calculated; Fig. 4 shows the dependence of this efficiency on coolant temperature. As may be seen herefrom, there exists an optimum value of  $t_{T,2}$ , which corresponds to the maximum efficiency. Fig. 5 shows the dependence of this efficiency (in consideration of losses and

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Card 2/3

MARGULOVA, Tereza Khristoforovna. Prinimali uchastiye: STERMAN, L.S.;  
RASSOKHIN, N.G.; DEMENT'YEV, B.A.; HERGEL'SON, B.P.;  
MIROPOL'SKIY, Z.L., red.; LARIONOV, G.Ye., tekhn. red.

[Design and calculations of steam generators of atomic electric  
power plants] Raschet i proektirovanie parogeneratorov atomnykh  
elektrostantsii. Moskva, Gosenergoizdat, 1962. 143 p.  
(MIRA 15:4)

(Boilers)

39003

E/060/62/012/006/006/019  
3102/3104

21.1000  
AUTHORS:

Sterman, L. S., Protsenko, V. P.

TITLE:

Choice of the optimum parameters for atomic power plants  
with gaseous coolant

PERIODICAL:

Atomnaya energiya, v. 12, no. 6, 1962, 488-496

TEXT: A method is described for choosing the optimum parameters of atomic power plants with gas-cooled reactors, those parameters being regarded as an optimum which correspond to a minimum of cost. The usual definition of optimum parameters as corresponding to the maximum efficiency is not accepted because of its ambiguity. The new method is based on the simultaneous consideration of the factors determining the thermal power and of economic data. It is also taken into account that the maximum admissible surface temperature of the fuel elements has a definite limit. The parameters desired are regarded as an optimum when the calculated specific cost (in rubles/kwh) reach a minimum. The curves  $Q_s/Q_s^0$ ,  $\eta_{el}$  and  $\eta_{el}^n$  obtained as functions of the coolant

Card 1/2

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PHASE I BOOK EXPLOITATION

SOV/6485

Sterman, Lev Samoylovich, Doctor of Technical Sciences

Teplovaya chast' atomnykh elektrostantsiy (Thermal System of Atomic Electric-Power Stations) Moscow, Gosatomizdat, 1963. 157 p. 3950 copies printed.

Ed.: A. V. Matveyeva; Tech Ed.: S. M. Popova.

PURPOSE: This textbook is intended for students of power engineering at technical schools of higher education and for engineers concerned with designing and operating atomic electric-power stations.

COVERAGE: The book describes the principal types of atomic electric-power stations. Steam cycles, thermal calculation and optimal-parameter selection are discussed. Soviet and non-Soviet industrial and semiindustrial atomic-power stations having various circuit systems are described. No personalities are mentioned. There are 48 references: 43 Soviet (including 12 translations), 3 English, and 2 Czech.

Card 1/4

*STERMAN, L. S.*

AID Nr. 980-2 31 May

**ATOMIC POWER PLANTS WITH SUPERHEATING IN A SEPARATE REACTOR  
(USSR)**

Sterman, L. S., S. M. Driven, and L. P. Kabanov. Teploenergetika, no. 5,  
May 1963, 35-38.  
S/096/63/000/005/003/011

An analysis is presented of several flow diagrams of atomic power plants with superheating in a separate reactor. This type of plant has been under development at the Moscow Power Engineering Institute since 1957. The following systems are considered: 1) a system with primary superheating in separate reactors, 2) a system with primary superheating in a separate

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AID Nr. 980-2 31 May

ATOMIC POWER PLANTS [Cont'd]

8/096/63/000/005/003/011

reactor and intermediate superheating in a heat exchanger, 3) a system with primary reactor-superheater only, 4) a system with primary superheating in a separate reactor and intermediate superheating of vapor from a low-pressure turbine in a heat exchanger, and 5) a system with standard turbines operating at supercritical parameters. The following conclusions are drawn: 1) In power plants with turbines operating at inlet pressures of 130 atm and temperatures of 565°C, it is advantageous to generate steam and superheat in separate reactors. 2) The power plant with secondary superheating in a heat exchanger is very economical. 3) For a plant with turbine inlet parameters of 130 atm and 565°C, a system with a reactor-evaporator and a reactor-superheater but without intermediate superheating can also be used. 4) A power plant with supercritical parameters (240 atm, primary superheating to 580°C, and intermediate superheating to 560°C) can be designed using lot-produced turbogenerators.

[AS]

Card 2/2



STERMAN, L.S., doktor tekhn.nauk; MIKHAYLOV, V.D., inzh.

Determination of critical thermal currents during the boiling of a high-boiling heat carrier in pipes. Teploenergetika 10 no.2:82-87 F '63.  
(MIRA 16:2)

1. Moskovskiy energeticheskiy institut.  
(Heat—Transmission)

(Steam)

ACCESSION NR: AP4037631

S/0096/64/000/006/0007/0010

AUTHOR: Margulova, T. Kh. (Doctor of technical sciences); Sterman, L. S. (Doctor of technical sciences); Khayduk, K. (Engineer)

TITLE: Combined atomic power plants and their thermal efficiency indices

SOURCE: Teploenergetika, no. 6, 1964, 7-10

TOPIC TAGS: atomic power plant; atomic reactor, combined atomic power plant, reactor efficiency, reactor operation

ABSTRACT: Great interest is being shown in the higher efficiency of combined atomic power plants operating on both organic and nuclear fuels. The construction of many new plants is anticipated within the next decade. The thermal unit of the combined plant makes it possible to superheat the steam from the nuclear unit. Superheating of steam generated in both the thermal and nuclear units can be accomplished in the convective gas conduits of the boiler unit. Thus, superheaters can be made of ordinary steels, and the operating conditions would be the same as in ordinary boilers. Two thermal schemes for a combined plant are presented in which thermal and nuclear units operate at 1) the same pressure and 2) at different pressures. In each case, there is a considerable increase in the thermal

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ACCESSION NR: AP4037631

efficiency of the nuclear unit. Total heat consumption is calculated and the electrical efficiency of the plant is represented graphically as a function of the fraction of electric power generated in the nuclear unit for various initial parameters of both units; also, plant efficiency is tabulated for various parameters. Orig. art. has: 11 formulas, 4 figures, and 1 table.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Institute)

SUBMITTED: 00

DATE ACQ: 16Jun64

RECL: 00

SUB CODE: NP

NO REF SOV: 003

OTHER: 002

Card 2/2

L 20252-65 EWT(m)/EPF(n)-2/T/EPA(bb)-2 Pu-4 SSD/ESD/AEDC(a)/ASD(f)-3/AS(mp)-2

ACCESSION NR: AP4049894

S/0096/64/000/012/0056/0061

AUTHORS: Sterman, L. S. (Doctor of technical sciences); Shtekler, Kh. (Engineer);  
Zhidkikh, V. F. (Engineer)

TITLE: On the choice of parameters for a double mesh atomic electric power station  
with hydraulic coolant

SOURCE: Teploenergetika, no. 12, 1964, 56-61

TOPIC TAGS: double mesh atomic power station, hydraulic coolant, steam generator,  
feed pump, heat transfer

ABSTRACT: A method was developed for choosing the parameters for optimal thermal  
economy of a double mesh atomic power station using a hydraulic coolant. The basic  
parameter is represented by the difference between the reactor outlet temperature  
and the steam generator outlet temperature. The heat transferred from the reactor  
to the coolant is given by

$$Q_r = \frac{Q_{par}}{\eta_{tr} \eta_{r.u}} - k_{ts.n} \phi_{ts.n} N_E - k_{p.n} \phi_{p.n} \frac{N_e}{\eta_{tr} \eta_{r.u}},$$

$$\phi = \eta_{pr} \cdot \eta_{mekh.n},$$

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L 20252-65

ACCESSION NR: AP4049894

where  $Q_{par}$  is the heat transferred from the coolant to the working substance in the steam generator,  $k_{p.n}$  the fraction of the power spent on driving the feed pump,  $\phi$  the fraction of the energy returning from the pump to the first mesh ( $\phi_{ts.n}$ ) and the second mesh ( $\phi_{p.n}$ ),  $\eta_{pr}$  the efficiency of the drive mechanism, and  $\eta_{mekh.n}$  the mechanical efficiency of the pump.  $\eta'_{tr}$  and  $\eta_{r.u}$  are the efficiencies of the conduits in the first mesh and the reactor, respectively. For various values of the reactor outlet and steam generator outlet temperatures, the author plotted the heat transfer and the thermal efficiency values to obtain the optimal parameters for highest thermal economy. Orig. art. has: 13 formulas and 5 figures.

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Engineering Institute)

SUBMITTED: 00

ENCL: 00

SUB CODE: TD

NR REF SOV: 009

OTHER: 002

Card 2/2

SHENKIN, B. I.; MERKULOV, V. I.; VILEV, Y. I.; ABRAMOV, A. I.

"Critical heat flows in boiling of organic fluids in tubes and in large volume."

paper submitted for 2nd All-Union Conf on Heat and Mass Transfer, Minsk, 4-12 May 1964.

Power Inst, Moscow.

L 36727-65 EPF(c)/EPF(n)-2/EPR/EPA(s)-2/EWT(1)/EWT(m)/EWP(j)/EPA(bb)-2/EWG(m)/  
EWP(b)/T/EWA(1)/EWP(t) Pc-L/Pr-L/PS-L/Pu-L RM/NW/DJ/QS

ACCESSION NR: AT5007902

S/0000/64/000/000/0095/0106

AUTHOR: Sterman, L. S.; Petukhov, V. V.

TITLE: Investigation of heat transfer to organic fluids

SOURCE: Moscow, Institut atomnoy energii. Issledovaniya po primeneniyu organicheskikh teplonositeley-zamedliteley v energeticheskikh reaktorakh (Research on the use of organic heat-transfer agents and moderators in power reactors). Moscow, Atomizdat, 1964, 95-106

TOPIC TAGS: nuclear power plant, organic cooled reactor, power reactor, thermal reactor, heat transfer agent, organic coolant, isopropylbiphenyl, biphenyl

ABSTRACT: The heat-transfer coefficients to monoisopropylbiphenyl and biphenyl during variations in the process parameters were determined, and the results were compared with theoretical equations of different types. These coefficients were determined during turbulent flow in tubes without a change in the state of aggregation of the organic fluids. The heat-transfer coefficients to monoisopropylbiphenyl were determined at heat fluxes of 200,000, 500,000, and 860,000 Kcal/m<sup>2</sup>. hr and at circulation rates of 4, 6, 10 and 15 m/sec., and those to biphenyl were determined at a heat flux of 300,000 Kcal/m<sup>2</sup>. hr and circulation rates of 4 and 6 m/sec. Under these conditions, the Reynolds number was found

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ACCESSION NR: AT5007902

to fall within 25,000 - 420,000, and the heat-transfer coefficient varied from 3,000 to 18,000 Kcal/m<sup>2</sup>. hr.°C. Orig. art. has: 7 figures and 5 formulas.

ASSOCIATION: Institut atomnoy energii, Moscow (Institut of Atomic Energy)

SUBMITTED: 01Aug64

ENCL: 00

SUB CODE: TD, NP

NO REF SOV: 006

OTHER: 002

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L 36735-65 EWT(1)/EPA(s)-2/EWT(m)/EPF(c)/EPF(n)-2/ENG(m)/T/ETR/ENP(t)/ENP(b)

ACCESSION NR: AT5007903 Pr-L/PS-L/Pu-L S/0000/64/000/000/0107/0124  
RM/DJ/GS

AUTHOR: Sterman, L. S.; Mikhaylov, V. D.; Vilemas, Yu.; Loginov, A. A.;  
Abramov, A. I.

TITLE: Determination of critical heat fluxes when boiling high-boiling organic heat-transfer agents in tubes

SOURCE: Moscow, Institut atomnoy energii. Issledovaniya po primeneniyu organicheskikh teplonositeley-zamedliteley v energeticheskikh reaktorakh (Research on the use of organic heat-transfer agents and moderators in power reactors). Moscow. Atomizdat, 1964, 107-124

TOPIC TAGS: organic cooled reactor, thermal reactor, power reactor, nuclear power plant, reactor coolant, heat transfer agent, critical heat flux, biphenyl, isopropylbiphenyl

ABSTRACT: Critical heat fluxes were investigated during the surface boiling of high-temperature organic heat-transfer agents [monoisopropylbiphenyl] a mixture of biphenyl (26.5%) and biphenyl oxide (73.5%), and biphenyl in a tube. All the tests were conducted in a tube having a 10-mm inner diameter and a wall 1.5 mm thick. Experimental values of  $q_{crit}$  were obtained for monoisopropylbiphenyl and

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ACCESSION NR: AT5007903

circulation rates of 4 and 8 m/sec with a saturation temperature from 0 to 194C. The tests on the mixture of biphenyl and biphenyl oxide were conducted at pressures of 1, 3, 5, and 10 atm. and circulation rates of 5-15 m/sec with a temperature of 0 - 160C. It is pointed out that none of the existing formulas can be used to determine  $q_{crit}$  during surface boiling of these fluids. The authors conclude by deriving an equation for determining  $q_{crit}$  for volume and surface boiling under conditions of forced motion of a medium. Orig. art. has: 8 figures, 2 tables, and 14 formulas.

ASSOCIATION: Institut atomnoy energii, Moscow (Institut of Atomic Energy)

SUBMITTED: 01Aug64

ENCL: 00

SUB CODE: NP, TD

NO REF SOV: 020

OTHER: 007

Cord 2/2

MARGULOVA, T.Kh., doktor tekhn. nauk; STERMAN, L.S., doktor tekhn. nauk;  
KAYDUK, K., inzh.

Composite atomic electric power plants and indices of their thermal  
efficiency. Teploenergetika 11 no.6:7-10 Je '64. (MIRA 18:7)

1. Moskovskiy energeticheskiy institut.

STEFMAN, L.S., doktor tekhn. nauk; SHTEKLER, Kh., inzh.; ZHIDEIKH, V.F., inzh.

Parameter selection for two-stage atomic power stations with  
water heat carriers. Teploenergetika 11 no.12:56-61 D '64  
(MIRA 18:2)

1. Moskovskiy energeticheskiy institut.

L 11853-66

EWT(1)/EWT(m)/ETC(F)/EPF(n)-2/EWG(m)/T/EWP(j) WW/GS/RM

ACC NR: AT6001348

SOURCE CODE: UR/0000/65/000/000/0025/0031

AUTHOR: Sterman, L. S.; Petukhov, V. V.

ORG: Moscow Power Institute (Moskovskiy energeticheskiy institut)

TITLE: Heat transfer to organic liquids

SOURCE: Teplo- i massoperenos. t. I: Konvektivnyy teploobmen v  
odnorodnoy srede (Heat and mass transfer. v. 1: Convective heat exchange  
in an homogeneous medium). Minsk, Nauka i tekhnika, 1965, 25-31

TOPIC TAGS: heat transfer, organic compound, Reynolds number

ABSTRACT: The article describes experiments on heat transfer to organic liquids with varying properties over the cross section of the flow and gives a diagrammatic scheme of the experimental equipment. During the study, the circulation rate was varied from 4 to 15 meters/sec and the temperature gradient from 13 to 150°K. Under these conditions, the Reynolds number varied from 25,000 to 420,000 and the Prandtl number was between the limits of 5 to 36. Heat transfer was studied in an experimental tube with a diameter of 0.012 x 0.001 mm made of L-62 brass. In experiments with monoisopropylphenyl the length of the tube was 0.640, 0.880, and 0.920 meters. The tube was heated by passing an alternating

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UDC: None

L 11853-66

ACC NR: AT6001348

current through its walls. Temperatures of the liquid and the tube walls were measured by a conventional thermocouple arrangement. The temperature of the liquid was measured at the inlet and outlet of the experimental section and from these measurements, the temperature of the liquid at a given cross section was determined. Experiments in heat transfer to monoisopropyldiphenyl were carried out at circulation rates of 4, 6, 10, and 15 meters/sec. At each velocity the values of the heat transfer coefficient were determined for specific heat fluxes of 172, 431, and 740 thousand watts/meter<sup>2</sup>. The pressure was chosen so as to avoid surface boiling of the liquid. Usually, the temperature was at least 20° under the saturation temperature. The results of the experiments are shown in a figure. Orig. art. has: 5 formulas and 3 figures.

SUB CODE: 20, 07/ SUBM DATE: 31Aug65/ ORIG REF: 005/ OTH REF: 002

110  
Card 2/2

STIRMAN, L.S., doktor tekhn. nauk; VILEMAS, Yu.V., aspirant

Critical thermal currents during surface boiling of  
organic heat carriers on immersed surfaces. Trudy  
MEI no.63:59-72 '65. (MIPA 18:12)

40887-66 ENT(1)/ENT(m)/ENP(j) RM/GO/A.  
ACC NR: AT6021841 (A) SOURCE CODE: UR/0000/65/000/000/0131/0145

AUTHOR: Sterman, L. S.; Mikhaylov, V. D.; Vilemas, Yu.; Abramov, A. I.

ORG: Moscow Power Institute (Moskovskiy energeticheskiy institut) 35  
C+1

TITLE: Critical heat fluxes in boiling of organic heat transfer media in tubes and in a large volume

SOURCE: Teplo- i massoperenos. t.III: Teplo- i massoperenos pri fazovykh prevrashcheniyakh (Heat and mass transfer. v. 3: Heat and mass transfer in phase transformations). Minsk, Nauka i tekhnika, 1965, 131-145

TOPIC TAGS: boiling, heat flux, heat transfer fluid

ABSTRACT: Experiments on surface boiling in tubes were carried out in an experimental unit consisting of a closed loop with forced circulation. All the tests were made on a tube with an inside diameter of  $10 \times 10^{-3}$  meters, made of 1Kh18N9T steel. Values of the critical heat flux,  $q_{cr}$ , were obtained for monoisopropyldiphenyl at pressures of (2, 3, 5, 7, 8)  $\times 10^5$  newtons/m<sup>2</sup> and circulation rates of 4 and 8 meters/sec, while the underheating of the liquid up to the saturation temperature varied from 0 to 190°C. With Dowtherm, the pressures were (1, 3, 5, 10)  $\times 10^5$

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newtons/m<sup>2</sup> and the circulation rates from 5 to 15 meters/sec, while the underheating varied from 0 to 160°C. With ethyl alcohol, the pressures were (2, 5, 12.5)  $\times 10^5$  newtons/m<sup>2</sup> and the circulation rates of 4, 8, 10 and 15 meters/sec, while the underheating varied from 0 to 100°C. The article derives empirical dimensionless equations both for boiling in tubes and in a large volume (pool boiling). These equations are tested on existing experimental data from the literature and the results of the comparison are exhibited in a series of curves. Orig. art. has: 16 formulas, 6 figures and 3 tables.

SUB CODE: 20/ SUBM DATE: 09Dec65/ ORIG REF: 029/ OTH REF: 009

Card 2/2 MLP



L 63964-65 ENT(1)/EPA(s)-2/ENT(m)/EPF(c)/EPF(n)-2/ENP(j) RM

ACCESSION NR: AP5020563

UR/0294/65/003/004/0609/0616

536.423.1

AUTHOR: Sterman, L. S.; Vilemas, Yu. V.

TITLE: Critical heat flux<sup>21</sup> on submerged surfaces during boiling of organic coolants

SOURCE: Teplofizika vysokikh temperatur, v. 3, no. 4, 1965, 609-616

TOPIC TAGS: heat effect, heat transfer fluid, boiling, critical point, liquid flow, flow analysis

ABSTRACT: Critical heat flux on heat-transfer surfaces made of various materials are studied in a wide range of pressure variations with respect to the geometry and roughness of the surface during boiling of organic coolants (diphenyl, monoisopropylidiphenyl, diphenyl oxide, Dowtherm and benzene). A diagram of the experimental setup is shown in Fig. 1 of the Enclosure. The surface to be studied 2 is placed in the carbon steel high pressure chamber 1. Vapors of the liquid being studied are condensed in air-cooled condenser 3. The liquid is heated by a submerged tubular electric heater. Heat losses are compensated by nichrome coil 4 which is connected to a voltage regulator. Heat flux was created by passing an alternating current through the surface being studied. Calculation of this flux was based on the amount

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2  
of electric power fed to the surface. Transition from nucleate boiling to film boiling was determined by a sharp change in the resistance of the submerged surface at the critical point. An EO-7 oscillograph was used to pinpoint this change in resistance. The instrument was connected across the diagonal of a balanced bridge with the submerged surface making up the two arms. A thermocouple welded to the surface being studied was also used in determining the transition to film boiling. Heat fluxes determined by both methods were identical. Experimental and theoretical data are compared with respect to formulas derived by several authors, and a formula is given for calculating the average deviation of the experimental data from the values calculated by the various formulas. Orig. art. has: 5 figures, 3 tables, and 11 formulas. [14]

ASSOCIATION: Moskovskiy energeticheskiy institut (Moscow Power Engineering Institute) 65

SUBMITTED: 29Jun64

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OTHER: 007

ATD PRESS: 4671

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L 63964-65

ACCESSION NR: AP5020563

ENCLOSURE: 01

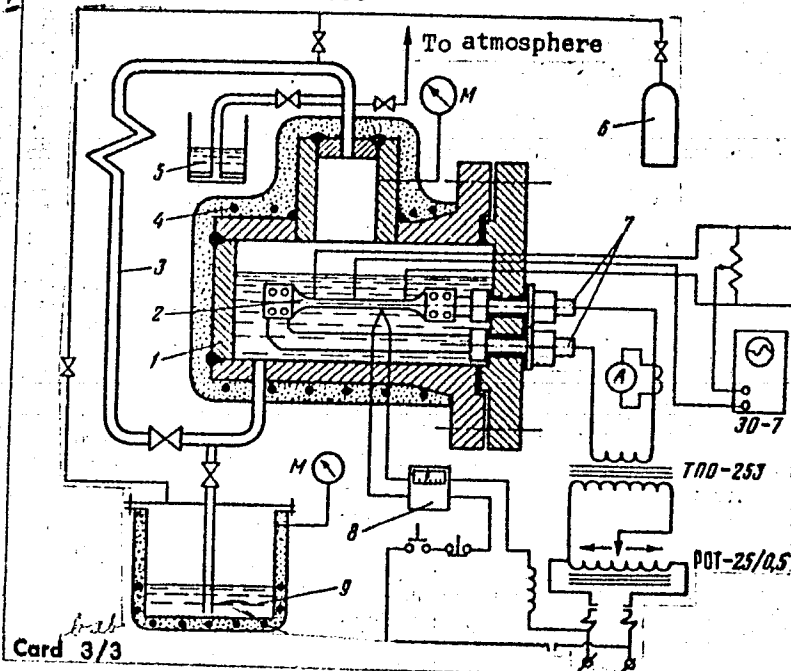


Fig. 1. Experimental set-up for studying heat exchange during boiling of liquids

- 1 - Pressure chamber;
- 2 - specimen being studied;
- 3 - condenser; 4 - electric heater;
- 5 - diffuser;
- 6 - compressed nitrogen;
- 7 - leads;
- 8 - pyrometric MRShPr-54 millivoltmeter;
- 9 - tank for coolant.

L 23524-66 EPF(n)-2/EWP(1)/EWT(1)/EWT(m)/ETC(m)-6 RM/WW/JW  
 ACC NR: AP6005895 (N) SOURCE CODE: UR/0096/65/000/011/0086/0089 63  
 AUTHOR: Sterman, L. S. (Professor, Doctor of technical sciences); 62  
Vilemas, Yu. (Engineer, Dissertator) B  
 ORG: Moscow Power Institute (Moskovskiy energeticheskiy institut)  
 TITLE: The effect of the thermal decomposition of organic heat transfer  
 media on heat transfer during boiling in a large volume  
 SOURCE: Teploenergetika, no. 11, 1965, 86-89  
 TOPIC TAGS: heat transfer fluid, thermal decomposition, convective  
 heat transfer, boiling  
 ABSTRACT: The article presents the results of an experimental investi-  
 gation of the effect of the thermal decomposition of industrial grade  
monoisopropyldiphenyl and diphenyl oxide on the critical heat fluxes  
 and the heat transfer coefficients during boiling in a large volume.  
 Pyrolysis of monoisopropyldiphenyl was carried out in a 20 liter high  
 pressure vessel made of 1Kh18N9T steel. Heating was done with a  
 Nichrome heater. The temperature of the liquid was measured with  
 Chromel-Kopel thermocouples. The desired temperature was held with an  
 accuracy of  $\pm 5^{\circ}\text{C}$ . Before the start of pyrolysis the liquid was boiled  
 Card 1/2 UDC: 662.987.536.24.001.5

L 23524-66

ACC NR: AP6005895

in the vessel for 15 minutes at atmospheric pressure for complete degassing. The unit was then sealed and pyrolysis was started at a liquid temperature corresponding to the saturation temperature. The initial temperature was 375°C. Samples of the liquid were taken during the decomposition process and the polymer content of the remainder was determined by vacuum distillation at a pressure of 10<sup>-5</sup> mm Hg. Heating was stopped when the polymer content reached 60%. Experimental results are exhibited in a series of curves. In general, it was found that the formation of polymers in organic heat transfer media leads to an increase in the critical heat fluxes and to a decrease in the heat transfer coefficients. The increase in the critical heat fluxes and the decrease in the heat transfer coefficients with an increase in the polymer content are due to the appearance of compounds whose boiling temperature is substantially different from that of the initial heat transfer medium. Orig. art. has: 5 figures.

SUB CODE: 07, 20/ SUBM DATE: none/ ORIG REF: 005/ OTH REF: 007

Card

2/2

STERMENSKY, O.

Cholesteatoma of the external auditory meatus. Cesk. otolar. 7 no.5:  
256-260 Oct 58.

1. Otolaryng. odd. OUNZ v Kezmarku, prednosta MUDr. O. Stermensky.  
(CHOLESTEATOMA, case reports,  
external auditory meatus (Cz))  
(EAR, EXTERNAL, cysts  
cholesteatoma of external auditory meatus (Cz))

L 13058-66 EWA(j)/T/EWA(b)-2 JK

ACC NR: AP6005728

SOURCE CODE: RU/0023/65/010/001/0041/0048

AUTHOR: Bergner, E.--Bergner, Ye. (Doctor); Stern, A.--Shtern, A. (Doctor);  
Vancea, D.--Vancha, D. (Doctor)

ORG: Department of Microbiology, IMF, Cluj (Catedra de microbiologie, IMF);  
Clinic No. 1 of Pediatrics, IMF, Cluj (Clinica I de pediatrie, IMF)

TITLE: Pathogenicity of the hemolytic strains of Escherichia coli

SOURCE: Microbiologia, parazitologia, epidemiologia, v. 10, no. 1, 1965, 41-48

TOPIC TAGS: bacteria, experiment animal, antibiotic, pathogenesis, bacteriology

ABSTRACT: A study of the morphological, biochemical and antigenic character, haemolytic and haemagglutinating capacity, dermonecrosis in rabbits and pathenogenity in mice, lysosensitivity and lysogenicity as well as sensitivity to antibiotics of 60 strains of haemolytic Escherichia coli and 33 non-haemolytic strains. No clear difference of any kind was found between the results with the two categories; also, it was not possible to establish a relationship between the haemolytic capacity and the pathogenicity of Escherichia coli strains. Orig. art. has: 4 tables. [JPRS]

SUB CODE: 06 / SUBM DATE: 11Feb64 / ORIG REF: 004 / OTH REF: 004  
SOV REF: 005

Card 1/1

UDC: 576.851.48.093.1:616.34-008.3-07

TIRLEA, J.; CUCU-CABADAIEF, L.; BICLESANU, A.; STERN, A.

Function tests in rheumatic fever. Cesk. pediat. 20 no.11:  
964-966 N '65.

1. I. detska klinika Cluj (Rumunsko) (prednosta prof. dr.  
J. Tirlea).



STERN, ALEXANDRU

✓ Oxidation of certain aldoses, ketoses, and alcohols with a new oxidizing bacillus (*Bacterium oxydans*). Alexandru Stern (Chem. Pharm. Lab., Cluj, Rumania). *Atad. rep. Populare Romane, Filiala Cluj, Studii. cercetari stiinf. 3, 105-21(1952)*.---A new oxidizing bacillus, *Bacterium oxydans*, was isolated from a medium of fermented raspberry or prune juice. It is somewhat similar to the *Bacterium dioxyaceticum* described by Virtanen and Barlund (C.A. 20, 3307) but it is differentiated by its medium of isolation, the thickness of the bacterial layer on the liquid, by the more elevated optimum temp. and by pigment formation. In addn. to scientific interest, this bacillus is of importance for the chem. and pharmaceutical industry. It was successfully used to oxidize glucose to gluconic acid, sorbite to sorbose to prep. synthetic vitamin C, and to oxidize glycerol to dihydroxyacetone. The bacillus possesses immunizing properties: administered to animals it causes the formation of agglutinins.

Francois Kertesz

CAPUSAN, I., dr.; BALOIU, P.; PINTICAN, E.; PRECUP, C.; RADU, H.; SLEAM, C.;  
STERN, A.; TOMA, V.

Clinical and bacteriological data on staphylodermatitis cases observed  
in the Cluj Dermatological Clinic between 1956 and 1959. Microbiologia  
(Bucur) 6 no.1:23-24 Ja-F '61.

STEPH, Boris M.

"Roentgen-diagnostic Significance of Some Pharmacological Effects for  
Accurate Diagnosis of Gastric Disorders."

paper presented at the Int'l Congress for Radiology, Munich, 23-30 Jul 1959.

Medical Institute, Leningrad.

YUGOSLAVIA/Nuclear Physics - Installations and Instruments. Methods C-2  
of Measurement and Research

Abs Jour : Ref Zhur - Fizika, No 3, 1958, No 5349

Author : Knop, L., Stern, F.

Inst : Not Given

Title : Isotope Enrichment with Slow Evaporation of Water

Orig Pub : Repts. "J. Stefan" Inst., 1956, 3, 149-156

Abstract : Samples of water were freely evaporated in an open vessel with a narrow surface of 0.16 square meters, from an initial volume of 4500 to 110 milliliters within 168 -- 192 hours, the near temperature of 13.2 -- 19.4°C and a pressure of 74 mm mercury. The density of the water samples collected during the evaporation processes was measured and their enrichment with isotopes ( $^{18}\text{O}$  +  $^{17}\text{O}$ ) (I) and D (II) was determined. Under the given evaporation conditions, the density of the tap and sea water compared with standard water was decreased on an average by  $4.69 \times 10^{-6}$  and  $1.85 \times 10^{-6}$  gram per cubic centimeter owing to the enrichment of I and II respectively; the density of

Card : 1/2

YUGOSLAVIA/Nuclear Physics - Installations and Instruments. Methods C-2  
of Measurement and Research

Abs Jour : Ref Zhur - Fizika, No 3, 1958, No 5349

APPROVED FOR RELEASE: 08/26/2000

CIA-RDP86-00513R001653310008-4"

water, previously subjected to vacuum rectification (increase of density by  $41.1 \times 10^{-6}$  gram per cubic centimeters) was reduced as the result of the evaporation, owing to the impoverishments of I and II, to such a content as in the former case.

Card : 2/2

STERN, Francisc

Cooperation with branch enterprises could be even better.  
Constr Buc 14 no. 675: 4 15 December 1962.

1. Secretarul comitetului sindicatului Trustului de constructiimontaj nr. 1-Bucuresti.

STERN, Kryda: ANDERS, Anna

Planned calisthenic exercises for young children. *Pediat. polska*  
32 no.12:1371-1378 Dec 57.

1. Z Kliniki Niemowlecej Instytutu Matki i Dziecka w Warszawie. Dy-  
rektor Instytutu: prof. Fr. Groer. Kierownik Kliniki: doc. I. Bielicka  
(EXERCISE

planned exercises for young child. (Pol))

STERN, C/

RUMANIA / Human and Animal Morphology (Normal and Pathological). S  
Lymphatic System.

Abs Jour : Ref Zhur - Biol, No 21, 1958, No 97123

Author : Russu, I.G.; Stern, Ch.; Chibu, H.; Lenguel, E.

Inst : Rumanian Academy, Cluj Branch

Title : Periglandular Spaces of the Large Intestine.

Orig Pub : Studii si cercetari med. Acad. RPR Fil. Cluj, 1956,  
7, No. 1-4, 13-23

Abstract : The intramural lymphatic system of the large intestine was studied on dogs through the method of infusion of lymph vessels. Periglandular lymph spaces were discovered, which surround the intestinal glands from all sides. These spaces have dimensions of 10-20  $\mu$  and, according to the authors' opinion, play an important role in the processes of absorption and excretion.

Card 1/1

Z/032/60/010/06/011/029  
E073/E535

New Method for Stress Calculations of Rotating Discs

of loading obeys the superposition law. The entire calculation can be mechanized by using punched cards. The calculations can also be carried out by means of manual calculating machines. The solutions can be made more accurate by using more accurate expressions for the respective derivations. Total calculation times as a function of the number of load conditions considered are given in Table 5. The use of the derived equations is illustrated on numerical examples. In the first example the calculations are carried out for a rotating disc of variable thickness, for which a calculation is published on p 220 etc. of a classical textbook by Timoshenko (Ref 2). There are 5 tables and 7 references, 2 of which are Czech, 2 Soviet, 2 German and 1 English.

ASSOCIATION: VZLÚ, Praha-Letňany

Card 2/2



STERN, Jiri, inz. (Praha 9, Huskova 26)

Use of an extended form of the Duncan-Frazar-Collar method  
for the expansion of the flutter stability determinant. Aota  
techn Cz 9 no.2:182-192 '64

STERN, Carl

Use of the matrix method and punched card machines for the strength  
calculation of the rolling type semianisotropic girder grillage.  
Reznery tekhni GAV 74 no.21.72 '64.

STERN, Josef

Economic aspects of Czechoslovakian health services. Plzen. lek.  
sborn. 24:151-155 '64.

1. Katedra marxismu-leninismu lekarske fakulty University Karlovy  
v Plzni (prednosta: doc. E. Jukl, CSc.).

SZECSENYI, Arpad, dr., a mezogazdasagi tudomanyok kandidatusa; STERN, Laszlo, dr.

Hygienic significance of the self-feeding of pigs with dry feed. Magyar allatorv lap 17 no.8:288-290 Ag '62.

1. Agrartudomanyi Egyetem Mezogazdasagtudomanyi Karanak Allattenyestestani Tanszeke (tanszekvezeto: Magyarai Andras dr., a biologiai tudomanyok doktora), es Budapest Fovaros Tanacsa Vegrehajto Bizottsaga Kozponti Hus- es Tejvizsgalo Allomasa (igazgato: Nagy Erno dr.).

HERBST, C.; IANOVICI, V.; MANESCU, M.; MIHAILESCU, V.; MORARIU, T.;  
MURGESCU, C.; STERN, N.; VLAD, C.

Geographical monograph of Rumania and the support of the  
Soviet geographers for its achievement. Analele geol geogr  
14 no.2:110-116 Ap-Je '60.

1. Membru-corespondent al Academiei R.P.R. (for Manescu, Morariu).

STERN, O., Dr., (Zagreb)

Prevention of dental caries in schoolchildren in Zagreb.  
Higijena, Beogr. 7 no.1-4:585-590 1955.

(DENTAL CARIES, prev. & control  
in schoolchild. (Ser))

PERN, ...

STEIN, A. The forging of horned cattle on the Florian Geyer Collective farms. p. 26.

Vol. 11, no. 15/16, Aug. 1956

MEYER, H. G. ZIMMAG

AGRICULTURE

Budapest, Hungary

So: East European Accession, Vol. 6, No. 5, May 1957

117

CA

Vasodilating action of small doses of adrenaline and  
ferrous ion. Ivan Ivančević and Payo Stern (Inst. Farmakol.  
Toksikol. Zagreb, Yugoslavia). *Ispravljena Izdanja Inst.  
Farmakol. Toksikol. Zagreb* 3, 11-17 (in English, 19-25)  
(1946).-- Ferrous ion does not affect the vasodilating action  
of adrenaline. William M. McCord



CA

1/c

Thymonucleic acid and penicillin Pavao Stern (Inst  
Farmakol i Toksikol, Zagreb, Yugoslavia) *Ispravak  
Izdava Inst Farmakol i Toksikol Zagreb* 3: 65, 1960

(French summary) --Thymonucleic acid antagonizes the  
inhibitory action of penicillin on the growth of strepto-  
cocci and staphylococci William M. McCord

Chemical constitution and antihistaminic action. 1. 1-Mono- and 1,4-disubstituted derivatives of piperazine. E. Cerkovnikov and P. Stern (State Institute for Production of Medicaments, Zagreb, Croatia). *Arhiv Kem* 18, 12-30 (1946). Starting with 4-phenylmorpholine (I) C. and S. synthesized a no. of piperazine derivs., some of which showed moderate or strong antihistaminic activity. The starting material was prepd. by a method different from those given in the literature. Several other well known compds. had to be made by new procedures, hence these are reported here. I was prepd. from 70 g. freshly distd. PhNH<sub>2</sub> in 500 cc. abs. ether, and 105 g. of a 30% soln. of NaNH<sub>2</sub> in vaseline oil. The reaction mixt. was refluxed with mech. stirring until the liquid solidified. Bis(2-chloroethyl) ether (108 g.) in 200 cc. abs. ether was added drop by drop (caution!), with cooling and mechanical stirring. After the reaction was completed, the whole was refluxed another 4 hrs., cooled, ice added, the medium made acid with HCl, and extd. with ether. The aq. layer was alkalinized with NaOH and I isolated in the well known manner. Fractionating twice through a column gave 35 g. (28%) I, bp. 144-6°, purified by crystn. from petr. ether as colorless tetragonal pyramids, m. 54-5°. HCl salt m. 169-70° (from acetone); HBr salt, crystal. from MeOH as needles and from acetone as bars, m. 182-3°; picrate m. 161-2° (from water). Crude I (16.3 g.), heated with 170 cc. fuming HBr in a sealed tube 8 hrs. at 120°, and the resulting melt distd. on a water bath *in vacuo* gave about 28.0 g. crude N,N-bis(2-bromoethyl)aniline (II)-HBr (III), minute crystals, m. 150-7° (crystal. (caution!) from acetone). III showed *physiol.* activity as a *resistant*. Its acetone soln. applied to the skin produced hyperemia and an erythema which reached a max. in 36 hrs. A burning sensation was felt on the skin, while the mucous membrane of the nose and the conjunctiva of the eyes were inflamed; the general state was bad (fever and weak feeling); the erythema decreased gradually and there developed a pigmentation of an unusually dark color which lasted 2 days, then became paler and disappeared by the 6th day after having been treated with the

Lohre ointment. During all this time the skin was sensitive to acids. The lethal dose (LD) of III was 2.0 mg. for mice. The respiration became difficult after this dose and the animal looked as if narcotized. The pharmacol. action (toxicity) was detd. by using a soln. of III in 50% MeOH. II, liberated from III with NaHCO<sub>3</sub>, bp. 187-9°, m. 123-5°; the crystals obtained from MeOH m. 32-3°; from "normal benzene" colorless tetragonal pyramids were obtained. III prepd. from II was identical with that synthesized as above (crystals from acetone, m. 150-7°). The *picronate*, which can be made either from II or III, m. 130-1° (from abs. EtOH). N-2-Hydroxyethyl-N-(2-bromoethyl)aniline (IV) was obtained as a by-product during the liberation of II from III. It was contained in the fraction boiling higher than II and was isolated by dissolving this fraction in MeOH or normal benzene; the crystals m. 79-80°. 4-Phenylthiomorpholine (V) was obtained from III by treating with K<sub>2</sub>S. III (25.0 g.) mixed with 115 cc. alc. K<sub>2</sub>S (prepd. from 11.3 g. KOH), the mixt. refluxed 2 hrs., cooled, the KBr removed by suction, the supernatant fluid distd. on a water bath, the residue mixed with 50 cc. 25% KOH and extd. 3 times with 100-cc. portions of ether, and the ext. worked up in the usual way gave 8.8 g. (76.2%) crude V, bp. 154-6°; the pure V, colorless tetragonal pyramids from normal benzene, m. 52-3°. V prepd. by another method was obtained as an oil, bp. 202-4° (Okac, C.A. 29, 708). The *picrate* of V, hexagonal prisms from abs. EtOH, m. 141-2°; HCl salt, rhombohedrons from abs. EtOH, m. 180-7°; HBr salt, lustrous colorless rhombohedrons from abs. ethanol, m. 207-8° (decompn.). From III with substituted amines were prepd. a no. of piperazine derivs. of the type PhN.CH<sub>2</sub>.CH<sub>2</sub>.NR.CH<sub>2</sub>.CH<sub>2</sub>, as well as the

corresponding salts with different acids. III (7.7 g.) and 10 g. p-Et<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> were heated in a sealed tube at 130° 24 hrs., 4.0 g. soda (Na<sub>2</sub>CO<sub>3</sub>) added, and the excess p-Et<sub>2</sub>NC<sub>6</sub>H<sub>4</sub>NH<sub>2</sub> distd. over with steam. The crystal product, 1-phenyl-4-(4-diethylaminophenyl)piperazine (VI), cooled and filtered from the reaction mixt. by suction,

sepd. from  $\text{AmOH}$  as tetragonal pyramids, m. 135-4°, from normal benzene as colorless platelets; yield, 3.0 g. (18.9%). The *tri-HCl* salt, possessing antihistaminic activity, crystd. from  $\text{MeOH}$ -ether as hygroscopic, colorless crystals, m. 223-4°; the LD for mice was 70 mg. A dose of 50 mg. did not protect a guinea pig against 1 LD of histamine. The *tripicrate*, crystd. from  $\text{AcOH}$  as yellow rhombic platelets, m. 181-5° (decompn.). III (11.5 g.) with 11.2 g. anisidine gave 3.76 g. (47.3%) crude 1-phenyl-4-(2-methoxyphenyl)piperazine (VII), b.p. 192-4°, sepd. from  $\text{AmOH}$  as colorless, lustrous, transparent platelets; recrystn. from normal benzene gave a pure compd. for analysis, m. 164.5-3°. VII, *2HCl* possessing antihistaminic activity, crystd. from  $\text{MeOH}$  as colorless, transparent, rhombic platelets, m. 215-16° (decompn., darkening began at 205°). The LD for mice was 30 mg. A dose of 50 mg. protected a guinea pig (300 g.) from 1 LD of histamine but 25 mg. did not (350-g. animal). VII (0.55 g.) and 15 cc. 68%  $\text{HBr}$  heated in a sealed tube 24 hrs. at 140°, and the reaction mixt. distd. on a water bath *in vacuo* gave nearly 100% 0.85 g. cryst. 1-phenyl-4-(*p*-hydroxyphenyl)piperazine-2*HBr* (VIII), recrystd. from  $\text{MeOH}$ -ether as colorless bars, m. 283-3° (cor.; decompn.). The LD for mice was 25 mg. This dose protected a guinea pig (410 g.) from 1 LD of histamine, but did not protect a 310-g. guinea pig from 2 LD of histamine. III (25 g.), heated with 15.7 (units not stated) (thanolamine and 10 cc.  $\text{MeOH}$  24 hrs. at 130°, the reaction mixt. distd. on a water bath, 15 g. solids added, and the excess  $\text{HOC}_2\text{H}_4\text{NH}_2$  distd. off with steam gave 1-phenyl-4-(2-hydroxyethyl)piperazine (IX), b.p. 172-5°; crystd. from normal benzene in colorless platelets, m. 82.5-3°. The yield is 7.3 g. (43.4%) crude product. The *Hx* deriv. (X) has antihistaminic activity. IX, obtained by the method of Prelog and Stépan (*C.A.* 20, 4013) from 1-phenylpiperazine and diethylene oxide, m. 91°. *It deriv.* (mono- $\text{HCl}$  salt, m. 214°). *Di-HCl* salt, possessing antihistaminic activity, crystd. from 5%  $\text{HCl}$  soln. in abs.  $\text{EtOH}$  as colorless tetragonal platelets, m.

180.5-8°. The LD for mice was 30 mg. A dose of 50 mg. protected a 440-g. guinea pig from 1 LD of histamine, while a 25-mg. dose protected a 420-g. animal only for 30 min. The same 25-mg. dose in a young cat lowered the blood pressure, which did not return to normal. *X-2HCl*, colorless, transparent lamellas from 5% aq.  $\text{HCl}$ , m. 106-7°. The LD for mice was 60 mg. A dose of 50 mg. protected a 140-g. guinea pig from 1 LD of histamine. A 25-mg. dose protected a 300-g. guinea pig from 1 LD of histamine, but for 30 min. only. IX (3.2 g.) is heated with 20 cc. of 65%  $\text{HBr}$  in a sealed tube at 130° 8 hrs., the reaction mixt. distd. on a water bath *in vacuo*, and the residue is recrystd. from  $\text{MeOH}$ -ether to give 6.0 g. (90.8%) 1-phenyl-4-(2-bromoethyl)piperazine-2*HBr* (XI), m. 239-40° (decompn.). XI (5 g.), heated with 10 cc. of a 33%  $\text{MeOH}$  soln. of  $\text{NHMe}_2$  in a sealed tube 20 hrs. at 130°, gave 1.4 g. (51.8%) 1-phenyl-4-(2-dimethylaminoethyl)piperazine (XII), b.p. 228-30°; *di-HCl* salt, possessing antihistaminic activity, crystd. from abs.  $\text{EtOH}$  as colorless lamellas, m. 200-7° (cor.). The LD for mice was 15 mg. A 50-mg. dose protected a 400-g. guinea pig from 8 LD of histamine, while a 300-g. animal was temporarily protected from 16 LD of histamine (excited by night). A 25-mg. dose protected a 450-g. animal from 2 LD of the same substance. A 5-mg. dose lowered the blood pressure of a kitten irreversibly. A dose of 25 mg. decreased the bronchial spasm (in a 13-kg. dog) caused by histamine. A 2-mg. dose prevented a spasm of the heart ventricle following resection of the vagus in a hare (1650 g.). A 5-mg. dose given in advance prevented or at least greatly delayed a bronchial spasm produced in an atm. of histamine and lasting normally 3 min. (guinea pig, 300 g.). A 2.5-mg. dose delayed for a max. time period the spasm in the same animal (290 g.). XII *dipicrate*, transparent yellow platelets from  $\text{HOAc}$ , m. 195-6° (decompn.) (on p. 25 the picrate salt is given as the dipicrate, while on p. 14 it is given as the tripicrate). Crude XI (8.6 g.) and 4.0 g. of a 95%  $\text{NH}_4\text{Et}$  soln. gave 1.9 g. (30.4%) 1-phenyl-4-(2-dimethylaminoethyl)piperazine (XIII), b.p. 235-6°; *di-HCl* salt, possessing antihistaminic activity, crystd.

from EtOH-Me<sub>2</sub>CO at colorless, lustrous, very hygroscopic rhombic platelets, m. 181-8°; the LD for mice was 70 mg. A 60-mg. dose did not protect a 320-g. guinea pig from 1 LD of histamine. The *dipicrate*, yellow rhombohedrons from glacial HOAc, m. 183-3°. From 8.6 g. XI and 3.5 g. piperidine is obtained 1.7 g. (31.2%) 1-phenyl-4-[2-(1-piperidyl)ethyl]piperazine (XIV), b.p. 195-200°; *tri-HCl salt*, having physiol. activity, crystd. from abs. EtOH, m. 282-3° (cor. in a sealed capillary). The LD for mice was 20 mg. A 25-mg. dose caused severe strychnine-type spasms and death in a 340-g. guinea pig. A 10-mg. dose did not protect a guinea pig (300 g.) from 1 LD of histamine. *Tripicrate*, crystd. from glacial HOAc, m. 168-9° (decompn.); XI (5 g.) with 3.7 g. (HOC<sub>2</sub>H<sub>5</sub>)<sub>2</sub>NH, gave 2.2 g. (61.7%) crude (nondistd.) 1-phenyl-4-[2-[bis(2-hydroxyethyl)amino]ethyl]piperazine (XV); *HCl salt*, very hygroscopic, crystd. from abs. EtOH, m. 200° in a sealed capillary; *tripicrate*, crystd. from H<sub>2</sub>O, m. 168-9° (decompn.); *di-Bz deriv-di-HCl salt*, needles, from MeOH and EtOH, m. 197-8°; *dipicrate*, tetragonal prisms from Me<sub>2</sub>CO, m. 151-2°. XI was converted into 1-phenyl-4-[2-(4-phenyl-1-piperazyl)ethyl]piperazine (XVI) by 2 routes: (A) by the reaction of XI (amt. not stated) with 0.3 g. of (C<sub>6</sub>H<sub>5</sub>)<sub>3</sub>NH, and using the same technique as that employed for prep. 1-phenyl-4-(2-dicyclohexylaminoethyl)piperazine. The tertiary base, isolated with *p*-toluenesulfonyl chloride and crystd. from normal benzene or MeOH, m. 172.5-3°; yield, 2.6 g. (61.9%). *Tetra-HCl salt*, crystd. from MeOH, m. 204-9° (cor.); (B) by treating XI with 2.25 g. 1-phenylpiperazine-HBr according to Prelog and Dfiza (C.A. 28, 1347°), adding 1.6 g. KOH and 50 cc. MeOH, refluxing the reaction mixt. 6 hrs., then distg. on a water bath. The tertiary base was isolated with *p*-toluenesulfonyl chloride. The cryst. product, obtained in 1.8 g. (55.7%) yield, was identical with that made by the procedure (A); *tetra-HCl salt*, possessing antihistaminic activity, crystd. from MeOH, m. 248-9° (cor.). The LD for mice was 40 mg. A dose of 25 mg.

protected a guinea pig (420 g.) from 1 LD of histamine. A 12.5-mg. dose did not protect this animal (220 g.) from the same amt. of histamine. The *tetrapicrate*, tetragonal prisms from glacial HOAc, m. 212-13°. III (22.0 g.) with 17.2 g. 4-aminotetrahydropyran (cf. Prelog, et al., C.A. 32, 5852°) in the presence of 2.2 g. NaOH and 60 cc. MeOH, heated in a sealed tube at 140° 24 hrs., the whole distd. on a water bath, treated with 8 g. soda, and the excess 4-aminotetrahydropyran distd. off with steam, gave 10 g. 1-phenyl-4-(tetrahydro-4-pyranyl)piperazine (XVII)-HCl (XVIII). XVII b.p. 228-30° and crystd. from normal benzene as colorless, transparent lamellae, m. 121-2°. XVIII, having antihistaminic activity, crystd. from methanol-ether as needles, m. 215-6° (cor.). The LD for mice was 15 mg. A dose of 40 mg. protected a 300-g. guinea pig from 1 LD of histamine. A 20-mg. dose protected the animal from the lethal action of the same histamine dose, but not from spasms. A 5-mg. dose given to a kitten (female, 3150 g.) irreversibly lowered its blood pressure. The *diHBr salt* of XVII, crystd. from MeOH-ether, m. 268.5-9.5° (cor.); *picrate*, yellow transparent lamellae of rhombohedral habit from EtOH, m. 202-3° in a sealed capillary. 1-Phenyl-4-[bis(2-bromomethyl)methyl]piperazine (XIX)-HBr (XX) is prepd. by opening the tetrahydropyran ring in XVII. Crude XVII (11.8 g.) and 150 cc. fuming HBr were heated in a sealed tube 24 hrs. at 140°, poured into 600 cc. H<sub>2</sub>O, and the resulting crystals sepd. by suction and dried at 100° *in vacuo* to give 18.8 g. (83.3%) crude XX, rhombohedral platelets from abs. EtOH-EtOAc, m. 210-11° (decompn.). 1-Phenyl-4-(tetrahydrothiopyran-4-yl)piperazine (XXI) was made by the same procedure as that used to prep. V. XX (4.7 g.), with 17 cc. of alc. K<sub>2</sub>S (from 1.7 g. KOH), gave 0.87 g. (21.3%) crude XXI, b.p. 220-30°; *di-HCl salt*, crystd. from abs. ether, m. 229-31° in a sealed capillary; *picrate*, yellow, short bars, m. 188.5-9.5° (from H<sub>2</sub>O). XX (5.0 g.), heated in a sealed tube with 4.0 g. PhNH<sub>2</sub> in 10 cc. EtOH at 140° 24 hrs., the reaction mixt. distd. on a water bath, 1.5 g. soda added, and the excess PhNH<sub>2</sub> distd. off with steam, gave 1.35 g. (39.6%) crude 1-phenyl-4-(1-

phenyl-4-piperidyl)piperazine (XXII); pptd. from acetone as colorless rhombohedral platelets with a pearly luster, *m.* 192-3°; *tri-HCl* salt, physiologically active, *m.* 269-70° (cor.; from MeOH). The LD for mice was 30 mg. and produced death with convulsions. A 50-mg. dose did not protect a guinea pig (290 g.) from 1 LD of histamine. XXII dipicrate, yellow tetragonal lamellae from dioxane, *m.* 205-6° (decompn.). XX (13.0 g.) and 7.5 g. 4-aminotetrahydropyran gave 1.2 g. cryst. 4-(4-phenyl-1-piperazyl)-1-(tetrahydro-4-pyranyl)piperidine, *m.* 174.0-5.0°; picrate, yellow platelets from EtOAc, *m.* 225-6°. XX (5.2 g.) and 2.7 g. ethanolamine gave 0.95 g. (20.7%) 1-phenyl-4-[1-(2-hydroxyethyl)-4-piperidyl]piperazine, *b.p.* about 250°; dipicrate *m.* 211-12° (from H<sub>2</sub>O). XX (amt. not given) and 2.8 g. 8-amino-6-methoxyquinoline, in the presence of 1.9 g. CaCO<sub>3</sub> and 15 cc. 50% EtOH, gave 1.9 g. 8-[4-(4-phenyl-1-piperazyl)-1-piperidyl]-6-methoxyquinoline, *b.p.* 250-5°, according to the method of Magilston and Strukov (cf. C.A. 27, 5112); tripicrate *m.* 176.5-8° (from H<sub>2</sub>O); *HCl* salt, pharmacologically active, was prepd. from the cryst. tripicrate and its LD for mice was 8.0 mg. The antimalarial activity was tested by the method of Roehl (*Arch. Schiffs-u. Tropenhyg.* 30, 311 (1926)). The fact that it proved inactive was to be expected from its constitution. An amino-substituted morpholine was next used to prep. an amino-substituted piperazine with antihistaminic properties. 4-(2-Aminoethyl)morpholine was prepd. by the method of Hultquist and Northey (C.A. 34, 2853). The *HBr* salt (XXIII), long, colorless needles from EtO-EtOAc, *m.* 127-8°, and the *HCl* salt, needles from MeOH, *m.* 187-8°, were prepd. for the 1st time. XXIII (8.5 g.) and 70 cc. fuming *HBr* gave 11.3 g. (63.4%) colorless rhombohedrons of 12-aminoethylbis(2-bromoethyl)amine-2*HBr* (XXIV), *m.* 167-8°. XXIV (9.0 g.) and 7.7 g. PhNH<sub>2</sub> gave 2.2 g. (52.5%) 1-phenyl-4-(2-aminoethyl)piperazine, *b.p.* 175-80°; picrate *m.* 203-4° (decompn.; from H<sub>2</sub>O). The *tri-HCl* salt, having antihistaminic activity, *m.* 266-7°

(cor.; from MeOH-EtOH); its LD for mice was 25 mg. A dose of 25 mg. protected a 420-g. guinea pig from 1 LD of histamine but did not protect this animal (350 g.) from 2 LD. The MeO-substituted piperazine was prepd. from 4-(*p*-methoxyphenyl)morpholine (XXV), synthesized by dissolving 123.0 g. anisidine in 1230 cc. abs. ether, adding 140 g. 30% NaNH<sub>2</sub> soln. in Vaseline oil, stirring 30 min., adding 141 g. bis(2-chloroethyl) ether drop by drop with cooling and stirring (attention), refluxing the mixt. about 1 hr., cooling, acidifying with HCl (caution!), extg. with ether, alkalizing the residue with NaOH, and removing the excess anisidine by steam distn. XXV, isolated with *p*-toluenesulfonyl chloride, *b.p.* 207-8°; crystd. from CCl<sub>4</sub>, or, better, MeOH, tetragonal platelets *m.* 71-2°. The yield was 98.0 g. (50.7%). XXV, *HBr*, light violet rhombic platelets from abs. EtOH, *m.* 195-6° (decompn.); picrate *m.* 107-8° (decompn.; from H<sub>2</sub>O). XXV (27.0 g.), treated with 240 cc. 68% *HBr*, the whole heated in a sealed tube at 130° 20 hrs., the mixt. distd. on a water bath and the residue recrystd. from MeOH gave 36.8 g. (04.6%) *p*-hydroxy-*N*-bis(2-bromoethyl)aniline-*HBr* (XXVI), colorless rhombobhedrons, *m.* 221-2°. XXVI (37.9 g.) and 17.0 g. ethanolamine, heated in 90 cc. MeOH in a sealed tube 24 hrs. at 130°, the mixt. distd. on a water bath, 5 g. soda added, the volatile base redistd. with steam, another 10 g. soda added, the whole extd. several times with ether, and the ether ext. dried over K<sub>2</sub>CO<sub>3</sub> gave 2 g. 1-(*p*-hydroxyphenyl)-4-(2-hydroxyethyl)piperazine (XXVII), *b.p.* 198-200°. The alk. mother liquor remaining after the ether extn. was acidified with HCl, evapd. *in vacuo* to dryness, the residue extd. with abs. ethanol, the ext. distd. on a water bath, and the residue converted into a picrate. The latter was recrystd. several times from 60% ethanol and converted into the *di-HCl* salt (XXVIII) of XXVII. Recrystd. many times from abs. ethanol contg. some HCl, 1.0 g. pure XXVIII, *m.* 219-20°, was obtained. Its LD was 30 mg. A 100-mg. dose did not protect a 400-g. guinea pig from 1 LD of histamine. The dipicrate of XXVII, prepd. as above, yellow, tetragonal prisms from

and EtOH, m. 204-5°. Several other piperazine derivatives were prepared, using the method of Froberg and coworkers (J. Med. Chem., 1955, 20, 2600), for the purpose of testing their antihistaminic properties. The latter were found absent, but strychnine-like activity was present. The LD for mice of 1-phenyl-4-acetyl-piperazine-HCl was 4.0 g. (strychnine-type convulsions). A dose of 40.0 mg. killed a 350-g. guinea pig. A 20-mg. dose did not protect this animal (300 g.) from 1 LD of histamine. The LD for mice of 1-(p-methoxyphenyl)piperazine-HBr was 1.5 mg. A 40.0-mg. dose was lethal for a 350-g. guinea pig. A 20-mg. dose did not protect this animal from 1 LD of histamine. The LD for mice of 1-p-tolylpiperazine-HCl was 1.5 mg. (strychnine-like convulsions). A 40-mg. dose killed a 300-g. guinea pig, while a 20-mg. dose did not protect it (300 g.) from 1 LD of histamine. The LD for mice of 1-naphthylpiperazine-HBr was 1.0 mg. (strychnine-like convulsions). A 40-mg. dose killed a 300-g. guinea pig. A 20-mg. dose did not protect the same animal from 1 LD of histamine. The LD for mice of 1-phenyl-4-benzylpiperazine-HCl was 25 mg., with no convulsions. A 40-mg. dose did not protect a 300-g. guinea pig from 1 LD of histamine. The antihistaminic activity of all the compds. synthesized was tested by the method of Koncett (*Arch. exp. Path. Pharmacol.* 197, 27(1941)). XII was the most potent of all the substances which possessed antihistaminic properties. 20 references. I-Benzyl-4-(2-dimethylaminoethyl)piperazine. B. Cirkovic, N. Skarica, and P. Stern, *Ibid.* 37-40. The starting material for the above piperazine deriv. was made in a new way from  $\text{PhCH}_2\text{NH}_2$  and  $\text{CICH}_2\text{CH}_2\text{O}$ . The 4-benzylmorpholine (I) thus obtained was identified by conversion into the HCl, HBr, and picrate salts.  $\text{PhCH}_2\text{NH}_2$  (33.0 g.) 44.2 g. ( $\text{CICH}_2\text{CH}_2\text{O}$ ), and 40.2 g.  $\text{CaCO}_3$  in 100 cc. 25% MeOH were heated in a sealed tube at 150° 24 hrs. The reaction mixt. was then made acid with HCl, extd. with ether, the aq. layer alkalized with NaOH, and extd. several times with ether to give I, isolated with p-MeC<sub>6</sub>H<sub>4</sub>SO<sub>3</sub>Cl. I b.p. 137-8°; the yield was 15.5 g. I.HCl, color-

less, hexagonal crystals from abs. EtOH to which had been added a few drops of 15% HCl in abs. EtOH, m. 243-4° (cor.); HBr salt (II) m. 231-2° (from abs. EtOH); the picrate, yellow platelets from water, m. 187-8°. II (21.0 g.) and 120 cc. 60% HBr were heated in a sealed tube at 130° 24 hrs., the reaction mixt. distd. on a water bath, and the residue recrystd. from MeOH to give benzylbis(2-bromoethyl)amine-HBr (III), needles from abs. ethanol, m. 187-8°; the yield of crude crystals (from MeOH) was 18.8 g. (57.5%). III (18.8 g.) with 11.5 g. ethanol was 18.8 g. (57.5%). III (18.8 g.) with 11.5 g. ethanol-amine gave 8.24 g. (80%) 1-benzyl-4-(2-hydroxyethyl)amine, b.p. about 200°; 2HBr salt (IV), colorless trans-piperazine, b.p. about 200°; 2HBr salt (IV), colorless trans-piperazine, needles from abs. EtOH, m. 237.5-8.5° (cor.); parent platelets from H<sub>2</sub>O, m. 239° (decompn.). IV dipicrate, needles from H<sub>2</sub>O, m. 239° (decompn.). V (13.1 g.) and 50 cc. 60% HBr gave 12.0 g. (90.2%) crude 1-benzyl-4-(2-bromoethyl)piperazine-2HBr (V), indented bars from abs. EtOH, m. 229-0° (cor.). V (12 g.) and a 12% MeOH soln. of NHEt<sub>3</sub> gave 1-benzyl-4-(2-dimethylaminoethyl)piperazine (VI), b.p. 190-210°, isolated with p-MeC<sub>6</sub>H<sub>4</sub>SO<sub>3</sub>Cl in 4.6-g. (56.4%) yield. The LD (subcutaneous) for white mice of VI.HCl, m. 235-7° (from abs. EtOH), was 70 mg. A 25-mg. dose protected an 800-g. guinea pig from 1 LD of histamine, but did not protect a 600-g. animal from 2 LD. The effect of substitution on antihistaminic activity is seen from the fact that 1-phenyl-4-(2-dimethylaminoethyl)piperazine-2HCl has a stronger antihistaminic action in the guinea pig (see Part I). VI dipicrate, needles from H<sub>2</sub>O, m. 222-3° (cor.). 3 references.

C. S. Shapiro

STEIN, P.

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Technology

The influence of glycerophosphocholine on the action of Cholinesterase. p. 97, ARHIV ZA KEMIJU, Vol. 20, no. 1-4, 1948.

East European Accessions List, Library of Congress, Vol. 1, no. 14, Dec. 1952. UNCLASSIFIED.

B.A.

AIII - 16

**Cell-membrane permeability and allergy.** P. Stern and R. Kohn (Arch. med. legules., 1961, 6, 147—154).—With a modification of Heim's apparatus (Arch. exp. Path. Pharmac., 1959, 100, 1 and 212), the permeability of abdominal muscle of small mammals was studied. Permeability for Ringer's solution is reduced at the moment of contact of sensitized membrane of abdominal muscle with homologous antigen. Antihistamine does not prevent this reduction in permeability, i.e. does not prevent antibody-antigen union. Histamine may reduce permeability but never increases it. Intravenous injection of urea offers a new way of testing permeability, the substance gradually disappearing from the blood after allergic reaction. The experiments suggest that allergic reaction increases tone of the cholinergic nervous system. S. S. B. GILDER.



STERN, P.

Chemical constitution and antihistaminic action. V. Derivatives of thioalcohols. P. Stern, E. Cerkovnikov, R. Kosiak, M. Ternbah, Z. ~~Stenicher~~ and M. Drakulic. *Acta Pharm. Jugoslav.* 2, 99-102 (1952) (English summary); cf. C.A. 43, 604i. — Amicetthane, 1,2-ethanedithiol, 2-amino-1-ethanethiol, 2-(diethylamino)-1-ethanethiol, S-(2-diethylaminoethyl)isothiocuronium chloride, 2,3-dimercapto-1-propanol,  $(HSCH_2CH_2)_2O$ , 2-(diethylamino)-1-ethanethiol, glutathione, and cysteine were tested for their antihistaminic action. Cysteine and 2-amino-1-ethanethiol give pos. reactions. The results are in agreement with the theory of action of antihistamines. 22 references. V. Mihařlov

STERN, P.

YUGO

✓ Analysis of cations and amino acids in extracellular muscle fluid from the frog. S. Begović and P. Siera. *Acta Med. Yugoslavica* 6, 181-187 (1952); *Biol. Abstr.* 24, 2490 (1952).  
The extracellular fluid from muscles of the frog is found to contain a large excess of Na, K, and Ca as well as free amino acids. It is suggested that the extracellular fluid represents a plasma ultrafiltrate. A. M. M.

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11H

Effect of desoxycorticosterone and other steroids on the permeability of the synovial cell membrane. P. Stein (Med. Fakultät, Sarajevo, Yugoslavia). J. Mt. Sinai Hosp. N.Y. 19, 185-90 (1952) (in German). At a concn. of 10<sup>-6</sup>, desoxycorticosterone glucoside, devalin, digitoxin, and califerol reduce the permeability of this membrane *in vitro*. Histamine has a similar effect. Erich Hirschberg

STERN, Dr. Pauerl

"Investigations of Anti-leukaemic Substances in Leukosis Occurring in Hens." Dr. Pauerl  
Stern - prof. & chief of Pharmacological Inst. of Med. Faculty, Univ. of Sarajevo. Laura  
Spring - is chemist working at lab., Military Hospital, Sarajevo.

SOURCE: Vet. SVEZAK 2, p. 262, 1953